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The Farmer's Digest

Volume 10 November, 1946 Number 6

The Man Who Gave Us Bread

Condensed from Farm Journal

J. D. Ratcliff

EDGAR S. MCFADDEN is a quiet little man, a scant five feet, two inches tall. He has mild blue eyes, and a fringe of curly grey hair around a bald spot. Even in his home town, College Station, Texas, very few people know him. Yet a good case can be made for nominating him the most important man in the world today.

Thanks to his work, 25 million people are eating who would otherwise be dead or dying of starvation. During the war years he saved American farmers an estimated $400 million.

McFadden's development of disease-resistant wheat is a stirring saga of agricultural research. The job began before World War I, and was completed just in time to add hundreds of millions of bushels of wheat to stockpiles during World War II. The food situation is bad enough now. Without McFadden's work, it would be desperate.

McFadden's father, an up-state New York school teacher, migrated to South Dakota in 1882, and Edgar was born in a claim shanty in the boulder-sprinkled Coteau Hills during a February blizzard in 1891. His cradle was a grain bin filled with seed wheat.

Wheat was life to the McFaddens. A good crop meant plenty, a crop failure bankruptcy. Anything that was an enemy of wheat—hail,drought, early frost, rust, root rot—was an enemy of family security.

Young McFadden—"Stub" to his family, Mack to everyone else—learned this early in life. When he was 13 years old, a bull gored his father, nearly killed him. The boy had to put in the crop. It looked good, promised to make 40 bushels to the acre. Then stem rust struck. Pitted by fungus, stems broke and fell over. Wheat kernels that should have been fat and heavy were shriveled and dry. Instead of

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making 40 bushels an acre, the crop came in at five.

Spores of this disease, microscopic goose eggs, brick red, spent the winter in Texas. When summer came, they rode warm winds north. In a 24-hour period in bad rust years, as many as 600,000 of these spores would rain down on a single square foot of Dakota farmland! The ones which landed on wheat grew, sucked the life from the plant.

In the fury of this epidemic of wheat death, McFadden noted that there was one wheat which rust didn't bother. Yaroslav emmer stood erect while rust mowed down surrounding fields. But this tough, fibrous emmer was worthless stuff except as stock feed; it had to be ground or soaked before even pigs would eat it. Still, *it wasn't susceptible to rust.*

McFadden remembered this when he went to South Dakota State College, on a few dollars scraped from the family budget. He talked with one of his professors. Mightn't it be possible to breed this worthless emmer with good bread wheat—say mighty Marquis?

"Why don't you try it?" the professor suggested.

Older men of science had said that this could never be done, because emmer had 28 chromosomes, bread wheat 42. Any resulting progeny of such a mating would be sterile. Fortunately, McFadden hadn't heard of this.

He asked his landlady if he could have a small plot of land back of the house. She agreed, and in the spring of 1916, McFadden planted a row of emmer, a row of Marquis. It was touch and go whether the mating would come off. Marquis flowered early, emmer late. But there was one very short period of overlap.

With tweezers McFadden castrated the emmer flowers removing the anthers, or male parts. Then he dusted in pollen from the Marquis flowers and wrapped the heads in tissue paper to prevent any accidental pollination.

That fall there were a few poorly-developed seeds from the matings. There was no guessing what magic blood lines, if any, they contained. It would take several years to find that. Still there was a terrible urgency about the whole matter.

The year 1916 had been the worst rust year in history. The plague swept northward through the U. S. wheat belt, destroying 200 million bushels of grain. Then it moved into Canada to destroy 100 million more, and bankrupt more farmers. McFadden worried about this. Suppose rust struck with equal fury on two or more successive years? Or suppose it struck at the same

time in all wheat exporting nations? That would mean world-wide disaster. Such a thing had happened. A fungous disease blighted potato crops of the whole Northern Hemisphere in 1846, causing a world potato famine.

McFadden planted his handful of shriveled, unpromising-looking seeds in the spring of 1917. Day by day he watered them, waited for them to come up. Obstinately, they refused. It looked as though they were sterile, valueless. Then one green sprout showed! Only *one*.

On this slender thread hung the lives of millions of human beings—who are eating today because that seed sprouted. Grandchildren of that *one* seed are today growing on an estimated 15 million acres of U. S. and Canadian farmland — a wheat field larger than Switzerland.

That single seed, representing a cross which scientists said could never succeed, produced 100 shriveled kernels. These went into the ground in the spring of 1918. That fall McFadden was in an Army camp on the Pacific coast. He wangled a leave, a "harvest furlough." He didn't trouble the Army with details about how big his "harvest" was—a few rows of wheat a dozen feet long!

The war over, he came back to a job with the U. S. Department of Agriculture at the Experiment Station at Highmore, South Dakota. When an economy-minded Congress shut off funds in 1920, McFadden went back to the farm.

There is no way to hurry the tedious, painstaking business of plant breeding. You grow your crop, save the promising plants and throw the unpromising ones away. As soon as one problem is solved, another comes up. Thus, McFadden's wheat was good as far as rust was concerned. But it was susceptible to root rot. And it made dark flour—a mark against any bread wheat.

McFadden went to work on these shortcomings. He staked off a nursery plot near the farmhouse and set up a laboratory on the back porch. There was a borrowed miscroscope for identifying rust spores, a kitchen table work bench, a sagging cupboard. He made an incubator for rust spores out of an old trunk and a piece of storm sash.

While he was engrossed in his backporch science, things went badly on the farm. He was burned out by drought in 1921, hailed out in 1922, rusted out in 1923. He even saw this epidemic coming—saw it with his microscope. He trapped on vaseline slides the brick-red spores that were raining down on the wheat fields.

McFadden told his neighbors

that a terrible epidemic would break in two weeks.

Two weeks later rust arrived, the worst epidemic Day County had ever seen up to then. Grain was broken over—everywhere, that is, except in McFadden's nursery. His test rows of emmer-Marquis cross stood strong,erect. The rust detoured around them. This was triumph, but it didn't help the condition of the McFadden bank account.

He begged the Agricultural Committee of the State Legislature for funds to continue the work, but got nowhere. Since the farm was already mortgaged to the hilt, banks turned a deaf ear. There were two sources of money left: his household goods and his insurance policies. McFadden threw in everything for one last gamble.

By the following year the wheat in the nursery was good enough to deserve a name, and McFadden called it Hope. It was a good name, for the wheat offered little more than Hope. There were all sorts of things wrong with it. It produced low yields of light-weight grain. It was highly susceptible to spring frosts.

Yet Hope had its good points, too. It was resistant not only to stem rust, but to leaf rust and five other major wheat diseases. It contained 42 chromosomes, the same number contained by all bread wheats, so breeders could easily cross it with high-yield wheats.

McFadden was not hungry for personal glory. He sent small packets of Hope wheat to wheat breeders all over the world, to speed up the work. In 1929 he rejoined the Department of Agriculture, his present employer.

For awhile in the mid-'30's it looked as though McFadden had lost the race. Researchers at the University of Minnesota produced a magnificent wheat named Thatcher, which was resistant to stem rust. But it lacked resistance to leaf rust. In bad years, leaf rust would lop ten bushels of wheat off an acre. Hope resisted both rusts.

Just as World War II started, a host of Hope derivatives—grandchildren of McFadden's original cross—began hitting the market. Superior new wheats like Rival, Pilot, Mida, Cadet began crowding Thatcher out of wheat fields.

Another new one, Austin, was planted on a million acres in Texas, much of it on land that could never produce wheat before because of the rust pestilence. Another Hope derivative took over almost the entire California wheat belt. Fifteen million acres are now given over to *Hope* grandchildren in the north.

It is difficult to assay Hope wheat in terms of human hunger,

but the money side is easier. A. W. Erickson, Minneapolis crop reporter, estimates that Hope derivatives saved farmers in the Dakotas and Minnesota $135 million in 1944 alone. A rust epidemic on the march would have destroyed that much grain.

Everything considered, it appears that $400 million is a conservative figure for savings during the war years.

For all the millions of dollars he has put in the pockets of farmers, McFadden has profited not a penny. New wheats aren't patentable. He lives modestly in Texas, now, still fighting man's bloodless battle for bread.

By producing better grains especially adapted to the Texas climate, he feels that he might whip the rust problem once and for all. With Texas planted to rust-resistant wheat, the spores which cause the disease will have no place to spend the winter. At that point final victory will be won.

Removing Broken Light Bulb

To remove a light bulb that has broken off in a socket, turn off the current, insert a cork and unscrew.

—*Capper's Farmer*

Vinegar Treatment for Scours

Condensed from The Jersey Bulletin

D. C. Jarvis, M.D.

THE beginning of our modern knowledge of the values of the apple in disturbances of the digestive tract may be traced back to an age old German folk treatment. In Silesia and Thuringia the peasants have long used apple scrapings to cure diarrhea.

Here in Vermont the apple has been used for many years by Vermont folk as medicine in the treatment of diarrhea but instead of using apple scrapings as used in German folk medicine cider vinegar has been used. As the results are the same it becomes evident that the same therapeutic factors are present in both the apple scrapings and the cider vinegar.

The old adage "an apple a day keeps the doctor away" has long been recognized as a very applicable saying, and calls attention to the fact that apples are very healthful for the human system. If one follows the line of changes when an apple is crushed one notes that the juice contains the sugars of the fruit. After the sugars are fermented and the juice is converted into what is generally known as hard cider, it still possesses the original properties of the apple. Again the changing of the hard cider containing alcohol into the acid of vinegar still finds the finished cider vinegar containing the original properties of the apple. Thus whatever healthful properties were in the original apple are passed on down to the cider vinegar, the only change being the changing of the sugars of the fruit into acid, which is vinegar.

If a native Vermonter who knows his Vermont folk medicine discovers the presence of diarrhea he adds one teaspoonful of cider vinegar to a glass of water. Such a mixture is taken at each meal. In addition it is also taken in the middle of the morning, the middle of the afternoon and at bedtime. The directions of Vermont folk medicine state one teaspoonful of cider vinegar in a glass of water should be taken six times a day. The dose is the same no matter what the age of the patient may be. If it is a child 3 years old it gets the same dose as an adult. Generally the diarrhea is cured in from one to two days when this treatment is used. It is sometimes referred to as "The Two Day Treatment of Diarrhea."

Reprinted by permission from Jersey Bulletin, Indianapolis, Indiana, August 25, 1945

Soon after I started studying a mixed herd of 54 dairy cows in order to learn what happened when the nutritional laws developed by Vermont folk medicine were observed in feeding the herd, the owner called my attention to a calf that was having an attack of diarrhea which he called "scours." He stated the presence of diarrhea in a calf was a very serious matter because the calf often died. He asked me if I had anything to suggest. I suggested we treat the calf as Vermont folk medicine would treat a human being that had diarrhea by giving it six ounces of cider vinegar and six ounces of water by mouth from a bottle. This was done and this one dose cured the diarrhea in this calf. If it had not done so this dose of six ounces of cider vinegar and six ounces of water given by mouth from a bottle would have been repeated in the morning when he went to the barn, at noon and before leaving the barn after the evening milking as long as was necessary. Soon after this a cow in this herd developed an attack of diarrhea. Six ounces of cider vinegar and six ounces of water were given this cow by mouth from a bottle after the evening milking and again the following morning after milking was over. These two doses cured the diarrhea in this cow.

I also studied a herd of 40 registered Jersey cows. At one time 25 cows in this herd developed diarrhea at the same time. Six ounces of cider vinegar were poured over the ration of each one of these 25 cows at each feeding twice a day. At the end of one day the diarrhea had stopped in some of these cows. At the end of the second day still others were cured and by the end of the third day the diarrhea had disappeared from all of the 25 cows.

Five days after the diarrhea had disappeared all 25 cows were back in full milk production. Usually following an attack of diarrhea there is a marked drop in milk production. This decrease in milk production is offset by the ability of cider vinegar poured over the ration of each cow at each feeding to increase milk production. If in a herd of 40 registered Jersey cows two ounces of cider vinegar are poured over the ration of each cow in the herd at each feeding not only will the appearance of diarrhea be prevented but the milk produced by the herd will increase 100 to 150 lbs. a day at the end of one or two months depending on how much out of condition a herd is at the time the cider vinegar is started. The cider vinegar used is that sold at the grocery store in gallon glass jugs or by the wholesale grocer in barrels.

If the one in charge of a herd cares to use six ounces of cider vinegar diluted when poured over the ration of a cow and diluted with an equal amount of water when given to a calf or a cow by mouth from a bottle he will find that no longer is diarrhea a problem in cows and calves. It is quickly controlled by cider vinegar, either by mouth from a bottle or poured over the ration at each feeding twice a day.

I studied a herd of 33 registered goats. In a goat, the bowel movements are in the form of pellets like a deer. If a goat develops diarrhea four tablespoonfuls of cider vinegar poured over the ration of each feeding will soon cure the diarrhea.

I have also spent time studying hens and chickens. When two-thirds of a cup of cider vinegar is added to 12 quarts of drinking water in a drinking fountain it will prevent the appearance of diarrhea in the hens or chickens. If diarrhea is present at the time the cider vinegar is first added to the water in the drinking fountain it will disappear in two or three days.

We have evidence then of diarrhea being cured in human beings with either apple scrapings or cider vinegar. We have also observed that when diarrhea is present in calves, cows, goats, hens and chickens it is cured by cider vinegar. The question then arises as to how this result is brought about.

In answering this question interest centers around five different effects that may be produced by cider vinegar. First, is its ability to improve digestion and speed up fermentation. If undigested hay or ration has been appearing in the bowel movements of a herd of Jersey cows the pouring of two ounces of cider vinegar over the ration of each cow at each feeding twice a day will cause this undigested hay and ration to disappear from the bowel movements at the end of two months time. This disappearance of undigested hay and ration from the bowel movements demonstrates that digestion has been improved. Because of this improvement in the digestion of the cow a ration containing less protein has to be fed. If the protein content of the ration is not reduced the effect of too much protein may be observed on some of the udders in the herd. Because of this improvement in digestion, each cow at the end of six months seems to be satisfied with about 10 pounds less hay each day and 50 per cent less ration each day. At the same time while eating less hay and ration she will make more milk and butterfat. This decrease in the amount of hay and ration consumed by a herd

has been brought about in two different herds of dairy cows.

It is the same in a human individual. If two teaspoonfuls of cider vinegar are added to a glass of water at each meal and this is sipped during the meal so that when the meal is finished the contents of the glass will have been taken the individual will observe as the months pass that he is satisfied with less food at each meal and will not be hungry between meals. His appetite will be excellent but it is satisfied by less food. If he is overweight he will notice that at the end of two months he will have lost about an inch in waist measurement. At the end of a second two months he will have lost another inch.

This shows that fat metabolism in the body is improved by cider vinegar. A human being that takes cider vinegar at each meal will observe as the months pass that his body, if overweight, becomes hard and firm. The body of a Jersey cow that has two ounces of cider vinegar poured over her ration at each feeding will also become hard and firm as the months pass. She will have an excellent appetite and be in good flesh but the fat is put in the pail instead of on her body as excess fat. This is noted by an increased butterfat content of the milk.

That cider vinegar brings about a marked change in the cow's body is shown by the fact that lice, if present, will leave the body of a cow having two ounces of cider vinegar poured over her ration at each feeding. It will be observed when the herd is on pasture that cows in the herd do not run from flies or show fly bites when they come to the barn. This is particularly noticeable when a newly purchased cow that has not been receiving cider vinegar on her ration joins the herd. She will show fly bites while the other cows will not. This effect of cider vinegar is also observed in a kennel of hunting dogs that have one tablespoonful of cider vinegar added to the ration of each dog at one feeding each day. The fleas will leave the body of these dogs and none will be found any time these dogs are examined.

The second effect of cider vinegar is its ability to destroy putrefactive bacteria in the digestive tract. We have evidence that putrefactive microorganisms in the digestive tract must be destroyed by cider vinegar because when a herd of Jersey cows has two ounces of cider vinegar poured over the ration of each cow in the herd at each feeding there will be no odor to the manure at the end of two months, showing that putrefactive bacteria no longer exist in the cow's digestive tract. Also

at the same time the odor disappears from the manure the odor of ammonia also leaves the barn, so that in the barn all that one smells is an animal odor.

In order to learn whether this happened only in this herd of 40 registered Jersey cows two other herds were selected to serve as controls. One was a mixed herd of 54 cows and the other a mixed herd of 15 cows. Both these herds received ordinary farm care. In the barn where each of these control herds was kept the odor from the manure and the odor of ammonia disappeared from each barn at the end of two months from the time cider vinegar poured over the ration of each cow in the herd at each feeding was started.

All these various observations indicate that what is in the apple whether it be in the form of apple scrapings or cider vinegar has a marked effect on the health of the digestive tract of chickens, hens, hunting dogs, goats, and the Jersey cow.

The third effect of cider vinegar relates to its pectin content. Part of the therapeutic results observed when cider vinegar is poured over the ration of a cow soon after the ration is placed in the feed trough are apparently due to the pectin which is present in cider vinegar. Pectin has a great swelling capacity. It has great absorptive qualities and the ability to draw water to itself. It is a binding agent. Pectin is the chief constitutent of foods in human nutrition responsible for the bulk in the intestine.

Pectin is the active jellying ingredient, and controls the setting of jellies and the consistency of preserves, jams and marmalades. It occurs naturally in all fruits, and varies in quantity and quality, depending on the variety and degree of ripeness of the fruit.

The largest per cent of pectin is in the apple. Pectin is prepared for market as follows: After the juice is pressed out of the ground apples for cider vinegar stock the resulting pomace is dried and from this dried pomace is extracted the pectin that remains. This extracted pectin is then sold to jam and jelly manufacturers, thus allowing them to use this with fruit juices which are more or less deficient in pectin content.

Pectin qualities may be outlined somewhat as follows: a jellifier, a stabilizer, a standardizer, a moisture binder and a thickening agent.

It is undoubtedly these qualities of pectin present in cider vinegar that account for the fact that when two ounces of cider vinegar are poured over the ration of each cow in the herd at each feeding twice a day soon

after the ration is placed in the feed trough the herd eats less hay and less ration and produces more milk and more butterfat. This takes place after the cows in the herd have been put in good physical condition by the addition of cider vinegar to the ration at each feeding. It takes from two to six months to bring this about.

The fourth action of cider vinegar is the detoxification of body poisons in the liver so that they may be rendered harmless and be eliminated from the body. If one studies the scientific literature relating to the apple he learns that there are two uronic acids — galacturonic acid and glucuronic acid—that are derived from pectin which are a part of the detoxificating mechanism of the body. Both galacturonic acid and glucuronic acids derived from the pectin present in cider vinegar are capable of forming products with toxic materials. The detoxifying of the toxic poisons by galacturonic acid and glucuronic acids takes place in the liver. These products formed with toxic materials enable the toxic materials to be eliminated from the body.

According to the literature the galacturonic acid and glucuronic acid derived from pectin reduces the breakdown of protein in the body. When a toxin appears in the body a breakdown of protein takes place in order to provide certain amino acids which can be used in a bodily synthesis of galacturonic acid and glucuronic acid to render the toxins harmless. The derivation of galacturonic acid and glucuronic acid from pectin in the cider vinegar makes it unnecessary for protein in the body to break down to provide certain amino acids for the synthesis of galacturonic acid and glucuronic acid. Pectin, thus, has a protein sparing action in the body of a cow. This is reflected in the lessened amount of ration taken each day by a dairy cow and explains in part why it is possible to reduce the protein content of the ration to that of a fitting ration.

There remains a fifth action of cider vinegar to be considered. According to the scientific literature relating to the apple there is present in the normal healthy mucous membranes in the body an enzyme called lysozyme made from galacturonic acid and glucuronic acid derived from pectin. This lysozyme is capable of dissolving in varying degrees practically all bacteria capable of producing disease. This enzyme is manufactured in the cells composing the mucous membrane and is carried from the site of its origin to the surface of the mucous membrane where it acts upon bacteria by mucous which is a viscous material secreted by

certain cells in the mucous membrane. Nearly all mucous membranes in the body are capable of producing the enzyme lysozyme if they have the material from which to make it.

Galacturonic acid and glucuronic acid derived from pectin in cider vinegar are used by the body both in detoxifying poisons and in the formation of the enzyme called lysozyme. The detoxification process being done in the liver and the enzyme lysozyme being formed in mucous membranes, the supply of galacturonic acid and glucuronic acid must be spread between the liver and the mucous membranes. In any shortage of these two acids the mucous membrances are the first to suffer with the result that bacteria will flourish.

The bactericidal action of a mucous membrane secreting the enzyme lysozyme is demonstrated by an absence of odor and discharge when a cow retains her afterbirth after giving birth to her calf. Six ounces of cider vinegar and six ounces of water when given a cow by mouth from a bottle at 5 a. m., 10 a. m., 3 p. m., and 7 p. m., each day as long as the afterbirth is retained prevents the appearance of discharge and odor.

Popcorn bought sealed in cans has the proper moisture content for best popping. Any popcorn in good popping condition can be kept that way by sealing it in a glass fruit jar, using a rubber ring.

—*The Farmer*

Denmark: Where Farmers Have Influence

Condensed from The Western Farm Life

John Strohm

AMERICA could learn a lot about farming from the Danes. Denmark is a land poor in natural resources and it is only half the size of Indiana, but this tiny country normally exports a fourth of the butter and eggs and a third of the bacon which enters the world's markets. And if a farmer doesn't get 60 bushels of wheat to the acre he thinks something is wrong.

There are few who are very rich in Denmark, but fewer who are poor, and 96 per cent of the farmers own their farms.

It's a country where the prime minister is a farmer, the king rides on horseback through the streets and stops at stop lights the same as anyone else.

Denmark has no oil, no coal, no iron, and even the soil is not very rich. Real Danish progress dates back to 1864, when Germany defeated the Danes in battle and took territory from the already small country to make it even smaller. It was then that the Danes rallied under the leadership of a bishop whose peaceful battle cry was, "What is lost without must be gained within." From that day Denmark grew from within as the Danes built for themselves one of the highest standards of living in the world. And the farmers were the keystone of that progress.

Let's look in on Vagn Jylenkierne, who took over an 80-acre farm from his father 2 years ago. You drive up a tree-hemmed lane to the red brick house, set in the midst of landscaped shrubbery and flower gardens, with white brick barns and buildings stretching out behind the house to form a quadrangle. My first thought was that this is either a Hollywood movie set, or one of those white-fence farmers who makes his money in the city to enjoy living in the country.

But no, Vagn makes his living —and a good living it is—on this 80 acres of land, as his father did for 35 years before him. His wheat will go 75 bushels to the acre this year. He's disappointed if he doesn't always get at least 65. One year his oats made 172 bushels to the acre. (He hurriedly explained that he didn't get that much every year.)

Right now he is milking 17 cows, beautiful Red Danish cattle that are making 410 pounds of

Reprinted by permission from Western Farm Life, Denver, Colorado, August 15, 1946

butterfat a year. He says if only he could get some protein feed, he could boost that to 450 pounds. (The average for all of Denmark is about 290 pounds — while in one of our best dairy states, Minnesota, it is less than 200.)

Vagn raises Landrace hogs, those incredibly long and narrow hogs which are tailor-bred for the English family which likes lots of lean meat. He has only 10 sows now—before the war when he could buy grain and oil meal he kept 20 sows. And those sows averaged 12 to 13 pigs a litter and raised him 400 hogs a year. The Danes don't go in for runt stock.

As a matter of fact, Vagn had just taken four pigs from a new litter to the government pig control station. He must do this if he expects to sell breeding stock. The pigs are fed a standard ration, and his sows are judged on the quickness and cheapness of gain, and the quality of carcass of these pigs. All hogs in Denmark are sold on carcass weight and quality at the bacon factory—their word for packing plant. (Eggs are sold by weight, too, not by the dozen.)

Vagn has his own small threshing machine, powered by electricity, and during the winter he threshes out the bundles which have been hauled into the barn.

"Why not thresh it all at once?" I asked.

"Because we have to have something to keep the men busy in the winter time," was the answer. Farm labor is so scarce right now that he has only one year-round man. Normally, he has two, pays each about $60 a month, plus board and room. Farm wages have doubled since the war.

Along with half the farmers of Denmark, he makes extensive use of electric fences. And he showed me an implement invented by a Danish farmer which looks like a drill without disks—it deposits liquid manure beneath the soil surface.

"One of our experiment stations has made tests which show that we get twice the value from fertilizer placed under the soil—or quickly plowed under," he explained. Just for fun, Vagn raises peacocks and pheasants.

While Vagn's farm is somewhat bigger than the average of 35 acres, it is not at all unusual. We could visit Ole Jensen who farms 100 acres, who keeps four men the year around. Ole belongs to the Farmers' Society, the co-op dairy, co-op bacon factory, co-op flax factory, the Landlords' Society, and the co-op store where he buys most of the groceries and feeds and other supplies that he needs.

He is also a member of an artificial insemination ring—one-fourth of all Danish cattle are

now bred artificially. A cow tester gives him a report on each of his cows every 3 weeks so he can feed them according to their production. (About half of the cattle of Denmark are so tested and fed.)

Ole's wheat will make 70 bushels to the acre this year, his average is about 65. He's gone out of the hog business and is not too happy about dairying right now—he can't buy feed.

Denmark lives by trading. She imports oil seeds, oil cakes and grain, and processes it through livestock into butter, eggs and poultry for the world. As much as 80 per cent of her production goes to the other countries. Since the war, these oil seed and grain imports have been cut off, and Danish farmers have cut their poultry and hog production in half. The Danish farmer will export about 70,000 tons of butter this year, but butter is still strictly rationed on the home front. Every time you eat in a restaurant you have to give coupons or you get no butter for your toast.

Danish farmers want a chance to produce more food for export. Before the war they exported 150,000 tons of butter, this year their export will be only half that. They export 185,000 tons of bacon normally, this year only about one-fourth that much. And they will only export 11,000 tons of eggs compared with the prewar 90,000 tons. The difference is imported feed and oil cake. The Danish farmer says he can make better use of protein than any other farmer. For every 100 pounds of oil cake he gets, he promises to produce an additional 12 pounds of butter and 16 pounds more pork.

Practically all Danish homemakers have electricity and many have vacuum cleaners, irons and washers. Their brick houses used to be roofed with picturesque thatch but the fire insurance rates are driving them to tile. Their homes are usually set in the midst of what we would call a yard, but they call it the garden—and garden it is with such varieties of roses, flowers and shrubs that you expect to see only in a nursery. The wives of most 40-acre farmers in Denmark have maids.

I could go on and on about the fresh, green landscape, the neat business houses, the beautiful apartment houses set in spacious lawns (where in our cities we too often have dirty slums) . . . but what's the secret?

It goes back to the great spiritual leadership of Bishop Grundtvig who founded the far-famed folk high schools. The purpose of these schools as he expressed it is: "To make accessible to young people a place where they may become better acquainted with

human nature and human life in general, and with themselves in particular, and where they will receive guidance in all civic duties and relationships and get to know the real needs of their country.

Through these schools farm boys and girls have become educated in such a way as to become spiritually as well as physically strong. And the farmer—though only 30 per cent of Denmark's 4,000,000—has thus become the foundation of the country's whole national culture.

The Danish farmers work hard, but it isn't dawn-to-dusk effort that does the trick. Farmers work, but they also read, take part in community enterprises, keep their schools and co-operatives real servants of the people. And today the farmer's party dominates the government of Denmark.

Denmark could not help but suffer during the Nazi occupation, the first time in a thousand years that their country had been occupied by a foreign enemy. But they had few Quislings, and their underground work of sabotage earned them high praise from General Eisenhower.

Some Look to America

Denmark has had unemployment insurance, old age pensions and the rest of our 1930 legislation for 50 years. And everyone has health insurance.

How Plants Use Water

Condensed from California Cultivator

R. E. Stevenson

A LIVING plant may be 75 per cent or more water. When it is harvested and dried, the dry material will be 90 to 95 per cent carbon, hydrogen and oxygen, which are the elements supplied by air and water. The total of the soil-supplied elements essential for growth — nitrogen, phosphorus, potassium, sulphur, calcium, magnesium, iron, copper, manganese, zinc and boron— may not constitute more than 3 or 4 per cent of the dry weight of the plant.

The relative abundance of the various elements, however, is not a measure of their importance for plant growth. A lack of any essential element, however minor the amount needed, retards plant nutrition with disastrous effects upon the harvest.

Water is just as essential as mineral nutrients for the growth of plants and the water built into the plant tissue or remaining in the sap, is only a small part of that which must pass into the plant during its growth period. A ton of cured hay may contain 200 or 300 pounds of water when marketed, but 400 or 500 tons of water may have been sucked from the soil through the root system and evaporated from the leaves while the ton of hay was growing in the field. The average amount of water used by the plant for producing a ton of dried growth is 500 tons. In extreme cases one square yard of leaf surface may evaporate more than a pint of water in an hour, whereas in very moist cool air transpiration may nearly cease.

A natural question to ask is, "Why all this seeming waste of water in hot, dry weather?" Even the most profound scientists do not have all the answers. Nutrients are carried into the plant in solution in water and are distributed within the plant by the flow of sap, which is largely water. But, it is known that plants can obtain the essential nutrients equally well with less water when all conditions are right, in fact, entirely independent of the evaporation of water from the leaf system. But, there must be enough water retained in the plant to prevent wilting and to provide for the normal functioning of the plant organs. There must be, therefore, other reasons, mostly unknown, why plants require so much water. To say that water keeps the plants from wilt-

Reprinted by permission from California Cultivator, Los Angeles, Cal., August 17, 1946

ing does not explain why so much should need to be evaporated from the leaves.

The important thing in agricultural practice is to know that the water is needed and to be able to provide it. Since the water is taken into the plant almost entirely through the root system and lost principally through the leaves, there should be some balance between shoot and root development. The shoot, often the only harvested part of the plant, cannot be large, unless the root system is also large and vigorously developed. The root system must be able to feed the top adequately for good growth.

The roots of plants are much branched and the growing root tips are often covered with root hairs which aid in water absorption. A single rye plant is reported to have grown a total of 387 miles of root system, in four months; more than three miles a day. There were 14,000,000,000 root hairs on the root system. This statement of root growth lends evidence to the view that roots grow through the soil to reach more moisture, rather than waiting for the moisture to come to the root by slow capillary movement. On this rye plant more than 100,000,000 new root hairs developed daily as the root reached new and moist soil from which to extract its needed water.

Root growth is governed by the nature of the plant, and by the quality of the soil. The principal retarding factors are hardpans, claypans and other formations through which roots cannot penetrate, and a water-logged condition of the soil. Roots must have air as well as water, and they do not develop where there is a high water table or poor drainage. If the soil becomes water-logged from excessive rains or irrigation those roots that are already developed do not function. Plants, therefore, may suffer for lack of water in the wettest places. Soils that are deep and permeable, moist but well aerated, permit the best root development and supply the most water for plant growth. Wet soils, therefore, need drainage and, even then, they may be suited only to shallow-rooted plants.

The amount of water evaporated (transpired) through the plant foliage is greatest in hot dry weather, provided of course that there is adequate moisture in the soil to be absorbed by the roots. In very hot, dry weather, even with the best of soils with adequate moisture in the soil, and a well developed root system which may occupy more than 10 feet of soil depth, plants may partially wilt during the day. This is because transpiration is more rapid than the capacity of the roots to take up water.

As the air heats with low hu-

midity the power of the dry atmosphere to take water from the foliage increases rapidly. Air at 95° F. (the temperature of a warm day) will hold nearly 10 times as much moisture at the saturation point as air at 32°, or freezing temperature. At 115°, which would be an unusual day, the saturated air will hold nearly twice as much moisture as at 95°. Air is never saturatd in hot, dry weather, and may be much less than half saturated. The pull of this dry air to remove water from the plant is governed by the temperature and humidity. Dry air at 86° is capable of receiving three times as much water as air at 68° and the pull upon the plant to remove water is about in that proportion.

The moisture is evaporated from the leaves mostly through tiny openings too small to be seen with the eye. These openings, called stomata, open in the light and close in the dark. They may partially close also in case of extreme shortage of water. There is, therefore, much less transpiration at night and leaves which partially wilt in the heat of the day may recover and look fresh and turgid in the early morning. These stomata, though only small openings, are capable of allowing enormous amounts of water to pass through. A single stomate is capable of evaporating 50 times as much moisture as a free water surface of the same area, and the entire leaf may evaporate half as much moisture as free water surface of the area of the leaf.

The openings, or stomata, of the leaves serve also to allow carbon dioxide gas from the air to enter the leaves. The green coloring matter of the leaves, called chlorophyll, enables the plant to use the energy of sunlight to combine the carbon dioxide obtained from the air and the water obtained from the soil in such a way as to produce what are called carbohydrates. These are the forerunners of what later become starches, sugars, cellulose and lignin which constitute the bulk of the plant material commonly harvested. Some of these compounds are further combined in such a way with nitrogen, sulphur, and phosphorus, as to produce the proteins that are associated with all plant growth. During the growth process the small percentage of soil-supplied elements essential for normal plant development find their place in the plant organism and serve their specific functions in contributing to rapid growth and a bountiful harvest.

In daylight, therefore, with adequate moisture and a fertile soil the plant is absorbing essential nutrients through the root system, while the leaves are building food materials from the water and carbon dioxide of the air.

With a shortage of water the food factory of the plant in the leaves must partially close down. When the openings of the leaves partially close there is no longer free entry of raw material (carbon dioxide) from the air for use in synthetic processes and the plant factory is partially idle. With fertile soil and adequate moisture, the entire plant system functions at highest efficiency.

Daylight, therefore, is the period of preparation for growth, while the most active growth period occurs at night utilizing the raw materials made ready during daylight hours. For about eight hours of the day the stomata are open and the leaves are doing most of their manufacturing.

Growth consists essentially of chemical reactions, in which complex compounds that are formed from the simpler sugars and nutrient materials accumulated during the day, result in adding stature and weight to the growing plant. Chemical reactions take place faster at higher temperatures about doubling for each 18° F. rise. This law holds for growth until the temperature is so high that the plant is injured. Many plants are seriously injured at temperatures of 120° or more. Temperatures of 80 or 90 degrees, however, are favorable to summer plants such as corn and beans if the water supply is adequate.

At high temperatures, therefore, the plant needs and must have, for adequate nourishment, more water than in cool weather. Deep-rooted plants will not suffer for lack of water as quickly as shallow-rooted. The quality of the soil, therefore, as it affects root development will influence the need for water. Shallow soils must be more frequently irrigated using less water at one time. Poor soils are likely to need more frequent irrigations, and certainly the amount of growth from a given amount of water is greater on a fertile soil.

Since every plant is essentially a little pump that is removing water from the soil, the spacing of plants must be given consideration relative to the moisture supply. Plants must be spaced thinner in a dry climate where irrigation cannot be provided. In extreme cases trees may be spaced more than twice the distance in a light rainfall area where there is no irrigation. Weeds or any other competing vegetation must be prevented or eliminated. When a ton of weeds is produced there is likely to be a ton less of crop to harvest, as weeds use as much or more water and nutrients as the desirable crops. In dry-farm practice soils are sometimes kept fallow and free from weeds for one season to save moisture to grow a crop the season following. Thus,

two years' moisture supply goes into one harvest.

Though the rich soil produces more harvest with the same water, a big crop, such as a six-ton yield of alfalfa, even on the best soil which is the only place a six-ton yield could be produced, would use an enormous amount of water. At 500 tons of water for a ton of hay (an average figure) the water used by a six-ton harvest if all placed on top of the soil at one time would produce a depth of nearly three feet. There is always some water lost by direct evaporation. Considerably more than three feet of water would, therefore, probably be necessary to produce a six-ton yield of hay—assuming that such a yield was possible.

Most crops probably do not receive water enough for maximum yields. There are periods between rains or irrigations when there are shortages of water in the soil. The plant adjusts itself to such situations by slowing down transpiration through partially closing the openings by which water is lost to the air, thereby slowing its growth. In extreme drouth some plants can slow down and remain alive for a considerable time, until the next rain or irrigation supplies water. Other plants, such as corn, cannot endure long with severe moisture shortage. A dry corn field in hot weather soon takes on the appearance of having been scorched by the excessive heat, whereas sorghum may remain alive and green much longer and grow again with the coming of moisture.

For a good harvest and efficient use of water, therefore, the soil should be made fertile in so far as possible with the use of fertilizers and good management. Irrigation, when used, should be frequent enough to prevent a slow-down in growth between irrigations and the entire root zone should be watered, which means irrigating according to the weather, the crop and the kind of soil. All competing vegetation must be controlled early in the season before the moisture has been removed from the deep soil. This may mean working down the cover crop or breaking a sod very early instead of waiting for more growth to plow under. Attention to these things will save water and bring the reward of a bigger harvest.

Septic Tanks for Farm Sewage Disposal

Condensed from Nebraska Farmer

E. A. Olson

Extension Agricultural Engineer, University of Nebraska

THE modern farm home with running water and a bathroom is not complete without a satisfactory sewage disposal system. A sewage disposal system must do the work for which it is intended, require very little attention, and it *must not* be a *menace* to the *health* of the family or the community.

Too often unsanitary practices are used with little or no thought given to the possibility of contaminating the family water supply and the general menace to the health of the family and the community.

The safe and sanitary disposal of sewage from the home can be accomplished economically by means of a septic tank and a suitable absorption system.

The septic tank should be a water-tight reservoir into which waste water and sewage from the house is emptied. Bacteria present in the septic tank decomposes the sewage into three substances; a mineral deposit referred to as "sludge" which settles to the bottom of the tank, a liquid known as "effluent" containing the dissolved sewage, and sewer gas. These bacteria thrive in the absence of air, and are known as "anaerobic" bacteria.

The scum and greases which collect on the surface of the water keep air away from the bacteria and thus create favorable conditions for the bacteria to decompose the sewage. Therefore, it is important that this scum be disturbed as little as possible. This can be done by the use of a sanitary tee inlet which also provides an escape for sewer gas.

Since the decomposition process in the septic tank requires 48 to 72 hours, it is essential that a septic tank have sufficient capacity to retain sewage for this period. When tanks of too small capacity are used, frequent cleanings are required and there is always a possibility of undecomposed sewage being carried into the drain tile causing trouble in the absorption system. A satisfactory septic tank for the average farm family should have a capacity of 500 gallons or more. A tank of sufficient capacity should not require the often ex-

Reprinted by permission from Nebraska Farmer, Lincoln, Nebraska, August 3, 1946

pensive and disagreeable job of yearly cleaning.

The shape or design of a septic tank is also important. A tank made with two compartments or chambers has been found to give longer satisfactory service than single chamber tanks. The double chamber tank produces a clearer liquid or "effluent" and offers less possibility of sealing the pores of the soil in the absorption system.

Septic tanks are made of a variety of materials. In selection, the probable life and cost should be considered. Some materials are likely to be lower in first cost but may have a relatively short life. Concrete lends itself very well for this use and is relatively low in first cost.

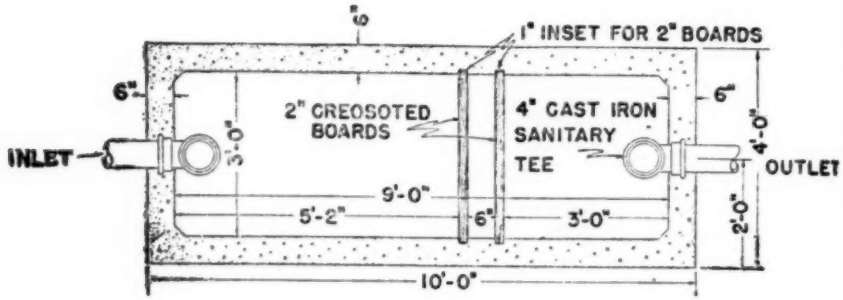
A septic tank installation is not complete without an adequate and carefully installed absorption system. Contrary to general opinion the effluent from the septic tank is not pure but contains many germs and bacteria and should not be emptied into a cesspool, an open ditch or allowed to come in contact with well water. A disposal field constructed of drain tile will probably be less expensive to build than a cesspool. It will also eliminate any possibility of sewage following underlying gravel strata or water veins and thus contaminating the family water supply.

An absorption or disposal field consists of two or more lines of drain tile laid 1½ to two feet below the ground surface. The liquid from the septic tank flows into the disposal field and seeps into the soil, where it is acted on by soil bacteria and oxygen. A properly installed disposal field will not freeze during the winter months if the ends of the tile lines are not exposed.

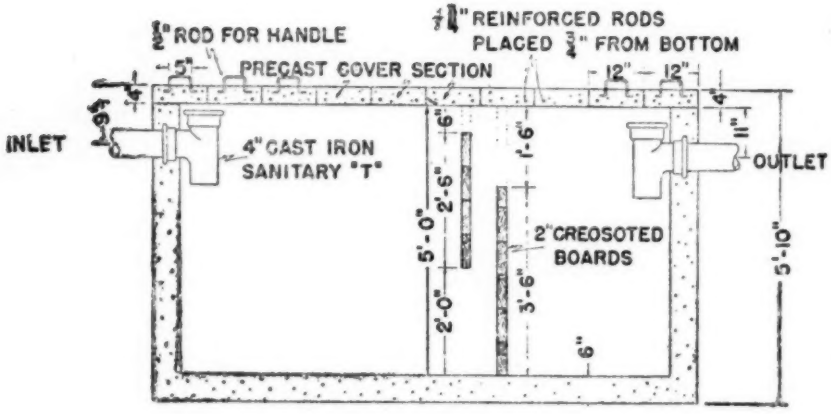
The amount of drain tile required in disposal fields for farm homes varies from about 150 to 200 feet in light sandy soils to 350 to 450 feet in heavy clay soils. Drain lines longer than 100 feet should not be used. Divider boxes should be used where lines branch. The drain tile should be laid in a trench on a 6-inch fill of coarse gravel. Two to three inches of coarse gravel above the tile increases the seepage area. The location of absorption systems near trees and shrubs must be avoided as roots will close the tile lines. Alfalfa roots are also a source of trouble.

The location of the septic tank and absorption system is an individual problem on each farm. Types of soil, topography, location of the well and vegetation must be considered in each case. Possible slope away from the house should also be considered to avoid placing the septic tank more than one or two feet below the surface. Adequate slopes of two to three feet per 100 feet make it possible to provide base-

SEWAGE DISPOSAL



PLAN VIEW OF SEPTIC TANK



SECTION VIEW OF SEPTIC TANK

ment drains directly to a septic tank with a minimum of digging. With lesser slopes, sump pumps are often used to remove wash water from basements.

More economical installations are possible if the sewage system can be located on the same side of the house as the bathroom. This may not be possible if the existing slopes do not permit. Care must be taken to avoid sharp bends in the sewer line from the bathroom to the septic tank. Quarter bends or turns are preferred instead of right angles.

A farm sewage disposal system is part of a well planned farmstead. Correctly designed septic tanks of sufficient capacity (see illustration) and a carefully installed disposal field will give many years of satisfactory service and will aid in providing a more sanitary environment for the family and community.

Kill Weed Seeds with 2,4-D

KILL Weed Seeds with 2,4-D . .

Weed seeds lost their ability to germinate when soaked for several hours in a solution of 2,4-D, tests at Michigan State College show. This suggests that it might some day be possible to sterilize land with this chemical to kill the weed seeds in the soil. The cost at present price of the chemical would be about $10 an acre, the Michigan trials indicate.

There is a joker, in addition to price, in this method of treatment, so the home gardener or farmer probably will want to experiment on an extremely small scale, if at all. This joker is the fact that garden and crop seeds are just as susceptible to the treatment as weed seeds. The toxic after-affects of 2,4-D in the soil may disappear in 6 weeks or less if the soil is extremely damp, tests by H. B. Tukey, Charles M. Hamner and J. E. Moulton indicate. If the soil is dry it is not known how long the effect will last.

The Michigan scientists will try sterilizing fields in the fall after weed seeds have dropped to the ground to determie whether the chemical's toxic-effect carries over until planting time in the spring. Tukey, Hamner and Moulton indicate that years of experimentation may be necessary to determine what practical application this method of weed control may offer.

—Capper's Farmer

"Butter" Without Churning

Condensed from Science for the Farm

W. D. Swope and C. D. Dahle

ANY farmer who owns a cream separator need not go without butter. He can obtain fresh sweet cream "butter" in a few hours from the time his cows have been milked. All he needs to do is run the milk through a cream separator fitted with an "inflow reducer" and out will come a product ranging from 68 to 75 per cent fat. Of course, strictly speaking, this is not butter and cannot be sold as butter because butter must contain 80 per cent milk fat. This product, however, will serve the same purpose as butter and if made from high quality milk will have a superior flavor.

This method of manufacture is much simpler than churning, and the "butter" obtained has a sweet fresh flavor not obtained in butter churned from ripened or sour cream. In farm butter-making, cream usually is churned. Churning, washing, and salting in buttermaking takes from one to one-and-a-half hours. In the suggested process, ripening and churning are not necessary.

Inflow reducers have been successfully used in classroom demonstrations here at the College for many years. The device is simple, inexpensive and will withstand years of use.

Milk containing any percentage of fat may be used. The higher the milk tests, the greater the percentage of fat in the finished product.

The milk may be separated at any temperature between 85 and 130° Fahrenheit; 120 to 130° will give excellent results. If the milk is separated at the higher temperature, fat is not likely to be lost in the skimmilk and the butter spread will contain a higher percentage.

An inflow reducer can be made by any tinner out of a flat piece of tin or stainless steel. It consists of a disc about two inches in diameter with an opening in the center. Attached to the opening is a funnel-shaped spout about one inch long having a reduced opening at the outer end. The size of this opening depends upon the percentage of fat desired in the butter spread. The opening should be one-third to one-half the size of the opening in the regular regulator cover. The smaller the opening, the higher the test of the finished product.

The inflow reducer is dropped into the opening in the regulating

Reprinted from Science for the Farm, Penna. Agric. Experiment Station, May, 1946

cover beneath the float of the separator. This results in a uniform restricted inflow of milk into the separator bowl. The inflow reducer reduces the flow of milk into the bowl, thus permitting the milk to be subjected to centrifugal force over a longer period of time which removes more of the skimmilk from the cream than in ordinary separation, thus giving a product containing a higher percentage of fat.

Directions for using the inflow reducer:

1. Assemble the separator bowl in the usual way.
2. Set the cream or skimmilk screws so that a cream containing approximately 30 to 40 per cent fat would be obtained with normal separating.
3. Place the inflow reducer in the opening in the regulating cover.
4. Bring the separator to normal speed.
5. Run one quart of water at approximately 120° F through the bowl. This will warm the bowl and remove any particles of dirt.
6. Place at a temperature of 120 to 130° F in the receiving tank.
7. Open the faucet to its normal position and catch the "butter" in a container.
8. When separating is completed, run about a pint of water at approximately 120° F through the machine to remove the product from the bowl.

While the product is still warm, add 1 to 1½ teaspoonfuls (approximately ¼ oz.) of salt to each pound or pint of the butter spread.

If coloring is desired, mix 10 to 15 drops of butter color with the salt for each pound or pint of product.

Stir the salt or salt and color mixture into the product while it is still warm. Stir until the salt is dissolved and the color uniform.

Allow to cool.

This results in a fresh, high quality butter spread. If a product that spreads exactly like butter is desired, it must be worked with a butter worker or ladle. To do this, the product after salting and coloring is cooled to 55 to 60° F and then worked until buttermilk appears. Then continue to work until this buttermilk is reincorporated and the product appears dry.

Salt and color may be added during working rather than earlier if desired. Need for working depends on whether a person wishes a product which spreads more like butter or would be satisfied with one which is slightly crumbly.

Other spreads can be made from the warm product as it comes from the separator.

While still warm, two parts of liquid honey may be added to three parts of the product. If de-

sired, a small amount of salt may be added.

Or, one part of maple syrup or crushed maple sugar may be added to four parts of the product.

Ways to Avoid False Molt

Condensed from Capper's Farmer

W. R. Whitfield
Iowa State College

THOUSANDS of tons of feed that ought to be producing eggs are wasted each year to grow feathers on pullets that go thru a false molt. Many flocks are 9 to 12 months old before they get down to the serious business of laying. Other flocks start early, do well for a time, then spend 2 or 3 months putting on a new coat of feathers.

Both groups are going thru a false molt—the former before starting to lay, the latter after production has started. In either case 2 to 4 dozen eggs a bird, worth 50 cents to $1 or more, are lost, and the feed wasted is worth. conservatively, another 30 to 60 cents. The two items mean millions of dollars in loss annually.

This waste can be stopped, but to do it, poultrymen must understand what false molt is, and know that, either the man who bred the chickens or the one who manages them is to blame for it. Ability to lay can be bred into pullets so they will start production early, and continue uninterruptedly thruout fall and winter if properly managed. If the poultryman buys that kind, and they do not mature and go into production at 5 to 6 months, they are taking a false molt. Telltale signs are the wing and tail feathers about the premises. This condition often is confused with immature molt. But there is this difference in the dropped plumage: Feathers of false molt are larger and round-tipped, those of immature molt smaller and pointed.

On handling birds in false molt, a careful operator will note that they are definitely underweight. The breastbone will be preceptibly sharp instead of rounded over with flesh. Combs and wattles will be underdeveloped and there will be many pinfeathers on the body.

There are many causes—overcrowded brooder houses, hot, unventilated shelters, lice, mites, lack of a full, well balanced

Reprinted by permission from Capper's Farmer, Topeka, Kansas, September, 1946

ration. These may be faults in the producer's method of rearing the birds. It is too late to do anything about it after they are old enough to house.

There is a final step that it may not be too late to remedy: Pullets should be housed before laying starts. Those on range, eating "salad" diets, often fail to gain the flesh required for development of the egg organs. Iowa demonstration flocks show that few owners are able to obtain 50 per cent production in fall and early winter when pullets remain too long on range. Some fear birds will get overfat if too well fed before housing. Practical results show that birds which remain in good flesh are not the ones suffering neck, body or wing molt.

E. J. Schmuecker, Iowa county, and Martin Bergers, Carroll county, had their pullets laying when 5 months old, and the flocks did not drop below 65 per cent thruout the winter. They separated pullets and cockerels before 12 weeks of age and provided range shelters with one square foot of floor space a bird. Pullets were self-fed on concentrate, whole oats and shelled corn. They were housed when they started to lay and confined the balance of the year. House openings were covered with 1-inch-mesh wire to keep out sparrows that might bring in mites. There was no false molt in either flock.

Burns Byron, who operates a rented farm on stock-share lease in Tama county, was skeptical of early housing. "I tried it a year or two," he said. "Pullets laid a while, then went into a molt when hot fall days hit." Inquiry showed his laying house was a remodeled barn. It was extremely hot. All windows were on the south so there was no air movement thru it to carry off excess heat. He remodeled, installed open windows on each end of the building and his early housed pullets have continued to lay uninterruptedly since.

Causes for well-grown pullets going out of production after starting well are numerous. A common one is rough handling when birds are moved. In contrast, those who handle birds carefully can move them without slackening production. Parasites in an uncleaned house is another common cause. The writer never has seen a louse-infested flock that was not in all degrees of molt. Another cause is sudden shock of low temperatures which continue 2 days or longer. Four days of sub-zero weather frequently will cause birds sheltered in an uninsulated or over-ventilated house to take 4 to 6 weeks vacation. Two of the flocks mentioned here were in houses fully insulated for the first time last

year. And, for the first time, their owners got more than 225 eggs a bird for the year.

Half the Iowa demonstration flock owners have improved housing to keep temperatures above freezing in winter. Flocks so housed produced an average of 2 dozen eggs more than the average of all demonstration flocks during the last year.

It is unwise to say winter molt can always be prevented. However, the best way to sustain laying of early pullets is, first, to give them the advantages suggested above and, second, to use properly adjusted electric lights when production starts to lag. Flocks that begin falling off day by day when blustery weather of early winter sets in may be brought back to former high production levels either by brighter lights or by all-night lights. Common lighting faults are irregular lighting, use of candlepower that is too low, lack of reflectors, lights that are too high or that are located so they do not shine on birds on the roost. Lights that are too strong can get production so high it cannot be maintained, with the result that a slump follows.

The Proof of a Good Sire

Condensed from The Shorthorn World

Marvel L. Baker

University of Nebraska

THE purebred breeder has a larger stake in the way commercial herds of beef cattle are handled than is generally realized. The bulls which he sells are judged by the calves which the buyer produces. The merit of these calves is determined not only by their breeding but also by the nutrition of their dams and the way the calves themselves are fed and managed.

The commercial beef cattle producer keeps beef cattle because they provide the most efficient means at his command of converting grass and roughage into marketable products of relatively high value. The success of his enterprise depends upon the efficient use of grass and roughage.

The beef cow, along with her offspring, is a remarkable machine for the conversion of grass and roughage into products more useful to man but she needs understanding help as she goes about her business. Many of the feeds which she is called upon to utilize are lacking in nutrients essential for her efficient performance and for that of her growing calf.

Mature grass and other carbonaceous roughages, even if provided in abundance, frequently are too low in protein and phosphorus to supply enough of these essentials for efficient production.

A few years ago in work at the North Platte Substation, heifers bred to calve when three years old were wintered on good quality prairie hay. They were of course given access to salt and water. The hay probably provided less than one-half pound of digestible protein and about 4.0 grams of phosphorus per head daily, whereas pregnant cows require about 0.8 pound of digestible protein and something like 16 grams of phosphorous. The requirements for lactation are even higher. So great is the ability of the cow to go through rather prolonged periods on inadequate feed and still perform creditably if she is provided with plenty of green grass during the

Reprinted by permission from the Shorthorn World, Aurora, Illinois, August 10, 1946

grazing season that these cows produced practically a one hundred per cent calf crop for the first two years. However, their calves weighed 8.0 pounds less at birth and more than 70 pounds less at weaning the first year, and 16 pounds less at birth and more than 70 pounds less at weaning than cows fed 1.0 pound of cottonseed cake per head daily for 168 days along with the prairie hay during the winter. The 1.0 pound of cottonseed cake increased the digestible protein content of the ration by approximately 75 per cent, and more than doubled the phosphorus content of the ration. For the third calf crop, only one-half of the cows fed hay without cottonseed cake during the winter produced calves where the cows fed cake produced practically a 100 per cent calf crop. Differences in the weights of the cows also were significant. In the winter season during which they were carrying their first calves, the heifers fed hay without supplement lost 100 pounds per head prior to calving about March 15, and more than 100 pounds per head between calving and about May 1 when they were put on grass. The heifers fed cake approximately maintained their weights both before and after calving.

When stalk fields, cereal straws, and similar feeds are used by the breeding herd, care should be exercised to see that plenty of feed is available, and that the requirements for growth, reproduction, and lactation on the part of the breeding female are met. The use of some palatable feeds such as good quality silage or other roughage, or fall and early spring pasture, will help insure the consumption of plenty of feed. The use of green pasture as late in the fall and as early in the spring as practical and the feeding of from 4 to 6 pounds of good quality legume hay or 1.0 pound of one of the oil meals per day will meet the protein requirements of the cow at least reasonably well, and pasture of good quality roughage should provide enough carotene to meet her requirements.

If salt is supplied along with the other feeds mentioned, it is unlikely that any serious mineral deficiency will be encountered. Giving the cows access to a mixture of two parts of steamed bone meal and one of salt while on winter rations or dry pasture, provides additional phosphorus which frequently is somewhat low in stock cattle rations. The requirements for protein, phosphorus, and carotene are higher during lactation than during pregnancy. Fortunately, growing grasses usually may be depended upon to supply these if the grass is abundant. Pastures should be

managed so they provide abundant, palatable feed over as long a grazing period as possible.

The needs of the growing calf are much the same as those of the breeding cow, and its feed frequently is too scanty or is deficient in protein, phosphorus or carotene. The basis for a satisfactory growing ration after weaning is a full feed of palatable roughage. Good quality hay, silage, ground fodder, sorgo hay, and other roughages are satisfactory. From 0.7 to 0.9 pound digestible protein, 16 to 20 grams of phosphorus and from 25 to 45 milligrams of carotene should be supplied daily by the feed.

The importance of quality in roughages for calves is well illustrated by results obtained at the Nebraska Station last winter with native grass cut for hay at different stages of maturity. In a 106 day period, calves fed early-cut hay which contained 7.0 per cent crude protein gained 43 pounds her head. Calves fed hay cut four or five weeks later and which contained 5.7 per cent crude protein gained 21 pounds per head and calves fed later-cut hay which contained 4.0 per cent crude protein lost 17 pounds per head. Where the three cuttings of hay were fed with one pound of soybean oil meal, the gains were respectively 138, 116, and 84 pounds per head. The results also indicate the importance of protein in the ration for growing calves. Feeding 1.0 pound of soybean oil meal per head daily for 106 days resulted in 95, 95, and 101 pounds of additional gain per head for the calves fed the three hays. Even with the early-cut hay which was relatively high in protein, feeding 100 pounds of soybean oil meal saved more than 2.0 tons of hay when measured by the feed required per unit of gain.

Frequently the addition of a limited amount of grain to the ration of the calf does not add to the cost of gains. In work at the North Platte Substation the addition of 5.0 pounds of ground rye, or ground sorghum grain to a ration of either sorgo silage or ground sorgo fodder and 1.0 pound of soybean oil meal increased the average daily gain of weaning calves from 1.12 pounds to 1.79 pounds per day and 5.0 bushels of grain replaced approximately 30 pounds of supplement, 275 pounds of fodder, and 1100 pounds of silage based on the feed requirement per unit of gain.

Feeding calves to obtain growth and good thrifty condition need not be difficult or expensive in comparison with letting them merely exist. A full-feed of palatable roughage supplemented to provide the levels of protein and phosphorus sug-

gested should result in average daily gains of from 1.0 to 1.5 pounds per day. The addition of 4.0 or 5.0 pounds of corn, rye, oats, barley, sorghum grain, dried beet pulp, or other concentrates should increase the average daily gain from 1.4 to 1.9 pounds. Growing calves reasonably well gives their hereditary growth possibilities a chance for expression, enables the producer to evaluate their sire, and generally is the profitable thing to do.

Purebred calves will eat the same kind of feeds as commercial calves and react to them in the same general way. Unfortunately, hundreds of bulls are sold every year without having been fed as well as suggested in this article for growing commercial calves.

On the Trail of Lippizaner Studs

Condensed from Pennsylvania Farmer

James F. Keim

Captain, A.M.G.

SHORTLY after I arrived in Trieste last spring, Capt. Weil, the chief agricultural officer A. M. G. Venezia Giulia, said: "We must try and get back to their stables the Lippizaner horses." He then told me the story — how this stable or stud, founded in 1580 at Lippiza near Trieste, producer of famous horses for riding and for drawing light carriages, had been carried off by the Germans to somewhere—presumably Czechoslovakia. The Germans had carried them off during World War I, and they had been returned. Napoleon, too, had carted them away, and they were returned after his downfall. They were the horses of royalty of all Europe. But where were the horses now?

I got all the data available and sent out two letters, one to Capt. Riding with the British military government in Austria and one to Lt. Col. Andrews with the American military government in Germany. In about two weeks came an answer from Capt. Riding. The horses were in the American zone of Austria. They would be returned as soon as arrangements for their repatriation could be made. Here in Trieste we began to hear stories of how different govern-

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ments wanted to get these horses and all sorts of yarns about their situation. So it was decided that I should go to Austria and find out the "exact situation." We were advised that this stud was under the personal protection of General Clark, U. S. Commander in Austria, and that I would have to get the permission of a certain Mr. Motz in Vienna in order to see them. Then we heard it was difficult to get to Vienna because we had to pass through the Russian zone. But I was to go to Austria and, accordingly, orders were "cut" for the trip.

A British corporal and I set out in a jeep for Austria. We were gone seven days, traveled 1,200 miles and we saw Austria as well as found the horses. In the course of our travel we met the head of the Spanish Riding School of Vienna and saw his troop of Lippinzaner stallions present an exhibition of riding set to old Viennese music that kept us spell-bound for almost two hours.

An exhibition of this school, a relic of the old Austrian court in all its glory, was performed by riders dressed in costume designed over 200 years ago. The riders sat as if they were part of the horses they rode, horses whose beauty, grace, style and intelligence made us gasp. They performed in a manner that seemed almost human as they followed the guidance of their masters. We saw the stallion that Hitler had promised to Hirohito. We listened to a story of how a centuries old institution, the Spanish Riding School, and the Lippizaner breed were preserved from complete dispersal during the exciting days that marked the downfall of Nazi Germany through the efforts of one man. He interested General Patton, who loved a good horse before he ever saw a tank. The General, hearing about these horses in Czechoslovakia, sent a tank task force to escort them to Austria and put them under the protection of the American Army.

Austria is a beautiful country. Its forests, its valleys, its mountains, lakes and rivers combine to make a ride through it an unforgettable experience.

The fruits of reforestation were on every hand—mountains clothed in beautiful forests of pine and larch, clear streams of water not fouled by the mud of eroding farmlands and mountain slopes. Busy sawmills were in operation. Logyards were full of the harvest of this policy of reforestation. Gorgeous shades of green covered every mountain side and slope. Trees that seem to march in battalions indicated that they had been planted by man. We passed through plantings that reminded us of the forest primeval, so dense that the

rays of the sun never penetrated their fastness. We saw trees whose mighty trunks went up straight as a die for a hundred feet or more. How I wished it were possible for the people of the U. S. A. to see the results of this reforestation policy.

We stayed the first night in Klagenfurt after passing through Caporetto and following the Isonzo to its source.

We conferred there with various military government officials, got a clearance to pass through the Russian zone, visited the Old Cathedral and took off. Bruck 'ander Mur' was our next stop.

Here we stayed in a typical old Austrian inn with its courtyard for the parking of our precious jeep. Next morning we went to Vienna, sometimes through narrow valleys, sometimes through narrow mountain gorges. Always the forests, the fields of rye, barley, potatoes and hay were on every hand. We saw hay drying on racks, and everywhere the people working in the fields.

Every town was crowded with small vegetable gardens. It was obvious that the folks were doing what they could to raise their own food. We saw barns made of brick which reminded us of the Pennsylvania bank barn. Herds of milk cows, large and of cream color, grazed on the meadows.

Passing through the Russian block post was an adventure. I wanted to get a picture of it but was told that it was "verboten." Finally at 1.00 p. m. on the 24th we arrived in Vienna.

Vienna Scarred by War

Vienna was once a beautiful city. Now it is scarred by war. Many of its finest buildings are burned and blackened ruins. Its people are hungry and discouraged. Its shops are empty. The strangest experience I had was to stand outside its cathedral St. Stephen, burned and blackened by fire, its beautiful windows destroyed, and hear organ music and the sound of services within.

We conferred about the procedure of getting the horses returned, about how we might exchange products and thus start the revival of trade, and then took off with letters of introduction for Linz.

Linz is in the American zone. Our journey to that city on the Danube took us westward through the valley of the Danube, beautiful with fields of rye, clover, alfalfa, potatoes and sugar beets.

Our destination was Wels, a short run from Linz. Here we found Col. Podhajsky busily getting ready for an exhibition by his famous Riding School that afternoon. It was more than we anticipated. We found that he had his stallions housed in the

barracks of his old Austrian regiment, the Fourth Dragoons. During the forenoon he told us of his experiences. He gave us a program for the afternoon's performance and a history of the school. We took a few pictures and looked over the stallions, the saddles, etc., and awaited the performance.

The exhibition was presented in an indoor pavilion decorated with the red and white of the Austrian empire. These stallions presented in seven different acts the results of the training program that lasts from four to six years and which begins with a special group selected from the stud farms when four years old. After their training is completed, the best ones are returned to the farm for breeding purposes. A total of about 70 stallions of the Lippizaner were kept at the school. It is the only remaining member of the former Spanish Horse, a race developed in Spain during the 700 years of occupation of Spain by the Moors through crossbreeding the native Spanish Andalusian stock and the Arab Berber stock. It is a horse very strong in the back with clean hard bone, medium height, about 14 hands, and weighing 1000 to 1200 lbs. Those we saw were all white with the exception of one, a dark bay. But the Colonel advised us that blacks and bays used to be more common. We saw one stallion that we were told was 18 years old.

After the performance we drove out in the country to see the mares, foals and young stallions. Germany had shipped to Mostau a total of about 300 horses from the original stud farm near Trieste. These consisted of stallions from 13 different families. While in Czechoslovakia over 200 were sold to various families and six of the mare families remain.

The Colonel told us that many mares lost their foals during the confusion and movement of the stud in May, 1940. As a consequence he expects a crop of only about 25 to 30 foals this year. But as we viewed the mares, the foals, the stallions in all stages of development, we were thankful that they had been saved and proud of the part our forces had played in this drama.

It's Easy to Double Pasture Yield

Condensed from Successful Farming

Jim Roe

FINDING a winning pasture combination is anything but simple. But that's been done for us by Dr. V. G. Sprague and Dr. R. R. Robinson, who tackled the problem armed with scientific know-how and dirt-farm practicality. Working at U. S. D. A.'s Regional Pasture Research Laboratory, at State College, Pennsylvania, they tore the pasture problem apart and put it back together in a form that can put your stock knee-deep in vitamins.

First of all, they knew that it's not fun to try plowing many of our pastures. In some, rocks and stumps make it all but impossible. In others, erosion hazards make it unwise. So they set out to see what else could be done.

They picked a gently sloping hillside which had been pronounced "worn out" for farming 40 or 50 years ago. It was let go to grass then—and had had no further care or treatment since. When the test started in the fall of 1942, the hillside was apologetically presenting a meager growth of poverty grass, cinquefoil, devil's paintbrush, and moss. Here and there were a few scattered plants of redtop and bluegrass.

Leaving part of the field just as it was for a check plot, Sprague and Robinson rolled up their sleeves and went to work on the rest. First of all, they applied two tons of lime to each acre. Then they tried various tillage ideas over a three-year period, refining their technique.

The first year, some of the ground was disked until all the old sod was torn up and killed. Beginning in August, this took several diskings of two or three times over each time, for rains would come along and help the dislodged sods re-establish themselves. Another strip was plowed four inches deep. One was torn up with a rigid-type field cultivator. And one was disked, then gone over with the field cultivator.

In each case, the plots were top-dressed with 1,000 pounds of 20 percent superphosphate and 260 pounds of muriate of potash per acre—applied with a grain drill before the last tillage. Then they were allowed to lie over

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winter before seeding in the spring.

The second year's tillage technique varied a little from the first. The experimenters substituted a heavy orchard disk for the regular field disk, which had proved rather light for the sod-cutting job. And they used it right after a rain, when the sod was not quite so tough. These tricks cut disking in half.

The rigid field cultivator tended to roll the sods up, so a flexible, spring-toothed model was tried, with much better results. This year, too, they again tried shallow plowing, and added a few new treatments—including the disk plow, the sub-surface sweep followed with the disk, and closely clipped plots to duplicate heavy grazing.

Final tillage experiment came the third year, when the cutaway disk, or bush and bog harrow, came into play. This is a heavy-duty disk, with the blades themselves notched much the same as cutaway rolling coulters. The disk is loaded heavily with rocks, and the cut-away feature makes it dig much more aggressively than a regular or orchard disk.

Over the three years, a large number of grasses and legumes were spring-seeded on these fall-tilled plots, in dozens of different combinations. Results of the different tillage methods showed surprisingly little difference. There was some erosion on the plowed plots while none at all was noticeable on the other treatments.

The plowed plots gave a lower yield of forage for the first year or two, but showed no difference in succeeding years. During the year of seeding they showed some wilting during the hot, dry spells of summer, which the others did not—probably because they allowed summer rains to run off.

Excellent stands of nearly all grasses and legumes were obtained on nearly all plots. Main exception was the clipped area. Here Sprague and Robinson were able to get a fair establishment of ladino and red clover, but almost no alfalfa brome or orchard grass and only a small amount of birdsfoot trefoil.

Of all the grass-legume mixtures tried, star performers were those including alfalfa or those with ladino clover plus a small amount of red clover to help increase the yield for the first two years. Mixtures including both alfalfa and ladino with a grass also gave good results.

Among the grasses, orchard grass and brome grass were most promising. Reed canary grass looks good so far. Tall oat grass gives a good first crop, but comes on so early the ground is not dried out enough to escape serious trampling.

Timothy has given an excellent first crop, but shows little recov-

ery for mid-summer grazing. Tall fescue is not too palatable. Birdsfoot trefoil, though it doesn't produce as well as alfalfa, is probably the most tolerant of mismanagement and overgrazing.

In these mixtures, prime point to remember is to manage the pasture to maintain the legume. In the case of the low-growing ladino, stock should be turned in when the orchard grass reaches a height of 12 to 14 inches. They may graze it down to about 3 inches. If it is let go higher than 12 or 14 inches it may crowd out the ladino. With alfalfa, you can wait and turn in the stock at the early-blossom stage — about the same time you would cut it for hay, since the grass will not crowd it out. Birdsfoot trefoil should be pastured when in the bud stage. It can be grazed down to a height of 4 inches the first year, and to 2 or 3 inches after that. But don't *hold* it that low. Rotate your pastures so it can grow high before being grazed again.

Length of time these mixtures will last without reseeding depends in a large part upon the management you give them. Red clover, of course, will bid you farewell in two years. Ladino will last up to 10 years if conditions are favorable, but may go out in 2 or 3.

Alfalfa is apt to leave you in 3 years, especially if it is attacked by wilt or is heavily pastured. Under good conditions it will stay for 4 or 5 years. Birdsfoot trefoil will probably last longer than alfalfa—and some growers claim it will last for several decades under ideal conditions. Tall oat grass or timothy will go out in about 3 years under heavy grazing. Brome, orchard grass, or fescue should last almost indefinitely with proper management.

Tho these tests have not yet run long enough to give reliable figures on the yield differences, the average yields of all the mixtures show sensational boosts over the untreated areas.

Here is what happened in terms of dry-matter yield: The check plot yielded a pitiful half-ton per acre each year, consistently. The limed and fertilized seed plots yielded a half-ton the first year, about a half-ton the second year, then climbed to 1¾ tons the third year. This delayed-action response was due to the fact that it took the first two years for wild clover to get established and start furnishing nitrogen to the rest.

The thoroughly renovated plots are the ones which will pull smiles from both man and beast. Instead of the half-ton yield, these plots produced 1¼ tons per acre the first year, 2¼ the second year, and climbed right on up to present a cool 3½ tons the third year! Let's take a look at

what that means in terms of increased cow pasture. That half-ton yield would furnish about 25 pasture-days for the season. The 3½ ton yield would give *seven times as much pasturage — and that's not all.* Cows will produce more milk from the same tonnage of feed because the seeded pasture grasses and legumes are much more nutritious than poverty grass and weeds. Such pasture treatment can well justify its cost.

And the system works under actual field conditions just as well as in these experimental plots. If you belong to the let's-see-it-done school, take a look at the Hector Grazing Association near Ithaca, New York. Starting with several thousand acres of abandoned ex-farmland—officially classified as good for nothing but timber—the Soil Conservation Service decided to see if poor land could be converted into pasture. Using similar systems, S. C. S. has brought nearly 1,000 acres back into profitable grass production.

Now, you're an exception if you don't have at least some pasture where the grass gets so low in midsummer that it would be mighty hard to mislay a baby snake! Improved pastures can save hundreds of bushels of corn —and no one needs to be reminded that corn and money look a bit alike in these days.

Turkey Filets

Condensed from Turkey World

DURING the fall and winter of 1945-46, the Department of Poultry Husbandry and Food Economics and Nutrition at Kansas State College cooperated in studying new cookery methods for cut-up turkey. It was deemed desirable to explore the cookery field to ascertain if there were not feasible methods of utilizing the large tom turkeys to better advantage.

Some of the methods of experimental cookery tried in the Department of Food Economics were: turkeyburgers, baked turkey loaf, jellied turkey loaf, crisp turkey slices, fried turkey, turkey cutlets, turkey steaks, stuffed baby roast, roasted quarters and halves, smoked turkey and turkey filets. Of all the above methods, together with others not mentioned, turkey filet was the most satisfactory. Technically, a filet is cut with the grain of flesh. The term usually is reserved for the choicest cuts of meat. Since most sections of the turkey, with the possible exception of the drumstick, are choice meat, filets as used here applies to the breast, wings, back, and high portions of the bird.

The turkey is dressed and drawn as for roasting. It may be plucked in the usual way or skinned. Since much of the flavor is in the skin, it may be left intact in most sections. In the region of the crop, it is too abundant to serve with the filets. In preparing filets the breast muscle is split along the keel and removed from the carcass by rolling and scraping. The thighs are separated from the body, and the drumsticks and bones are removed. The two "oysters" in the back and the flesh on the first joints of the wings are removed next and made ready to prepare as filets. The thick layers of muscle are separated and cut into strips, similar to beef liver, about one-and-one-half inches in width and three or more inches in length. These thick pieces then are cut butterfly fashion into one-third to one-half inch portions, slicing parallel to or diagoual to grain or muscle. The object is to make the portion twice as broad and about the thickness of a wafer steak. Each filet should weigh about three ounces. Experience will soon enable one to approximate this weight without having to weigh each piece.

The thighs are next divided into portions of about three ounces each. In our work the

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drumsticks also were served as filets; however, much time is required to remove the tendons and they are hardly worth the effort. The filets are pounded and flattened with a meat hammer and stored in the refrigerator until ready to cook. They may be prepared a few days before serving, or several weeks in advance, if frozen.

The number of filets will depend upon the size of the turkey. From one 24-lb. tom (drawn weight) 60 servings were cut as follows: White meat 28, thighs 18, drumsticks 8, shoulder strip 4, wings 2. From one 40-lb. tom (live weight), 90 filets were prepared. Both wings and drumsticks were utilized to obtain this number.

The preparation of filets for serving is a subject for the home economics specialist to discuss. However, for serving large numbers, it may be stated briefly here that after the filets are pounded and seasoned they are dipped in a batter made of flour, liquid, eggs, and salt, then in fine crumbs, and cooked brown in deep fat preheated to about 340 degrees F. Following this, steam-cook in a moderate oven for an hour. For family use, season and dip filets in a batter of milk and eggs and fry in a skillet as one would prepare young chickens, then braise in a skillet on top of the stove or in an oven until tender. The filets should be sufficiently tender to cut with a fork.

Turkey filets were served at the College Cafeteria a number of times, and at the annual College Alumni Banquet. On two such occasions, the patrons were given a "consumer report" to be filled out and returned after the meal was served. This was to obtain information on the acceptability of this product. The first group was composed of city consumers, and young toms were used to prepare the filets. The second group consisted of a Farm and Home Week audience, made up largely of turkey producers. Older toms, inclined to be somewhat less tender, were used on this occasion.

These figures indicate that turkey filets are quite acceptable and may develop into a new method of disposing of large toms which sometimes are a drag on the market and usually sell at a discount.

"It does not taste like turkey" was a comment made by many. This is not strange when we realize that "roast turkey" is the only form known to the public. There are many different ways of preparing and serving chicken, pork, beef, and fish. Perhaps a few new acceptable methods could be developed for serving turkey.

Turkey filets were tender, moist, delicate in flavor, attrac-

tive in appearance, convenient for serving, high yield per turkey, boneless, requiring little last-minute attention in meal preparation, but perhaps lacking in sales appeal until the public becomes educated to its merits.

Filets are well adapted to distribution in retail meat shops, prepared in advance during slack periods of the day—should such periods return—and placed on display in refrigerated glass cases should appeal to the public. The fact that one filet could be purchased for each member of the family, who could enjoy a turkey dinner at a cost of less than a dollar and without turkey scraps left over for several days, is worthy of consideration.

This product also is well adapted for storage in freezer lockers. Producers so inclined could prepare the filets, wrap in moisture-proof paper, and sell in quantity to city customers who are looking for opportunities to buy choice meat to store in their lockers for special occasions. Managers of locker plants also could do a nice business in this field. Frozen filets would make most acceptable gift packages, and they could be shipped by Airway Express to any point in the United States, and if packed in dry ice, to any part of the world served by air transportation.

With this method of serving turkey there are some by-products. The drumsticks, neck, wing tips, and giblets could be sold as soup stock or cooked and served as a meat loaf or in sandwiches. It has been suggested that where the quantity justified, the surplus skin, fat, and bones could be cooked by steam pressure and incorporated into a food for dogs, fox, or other meat-eating animals; as for example, those kept in city parks and zoos.

Large turkeys for small families have caused worries for both producer and consumer. The large turkey, 18 pounds and over, has the "tops" in finish, flavor, juiciness, and meat, all because of its maturity. In our markets of the future, one may expect to find turkey in the cut-up form; in this condition one has choices as to color of meat desired, flavor, size, and shape. It is reasonable to expect a large increase in per capita consumption of turkeys by small family groups, provided appetizing portions can be made available at a reasonable cost.

To Lime for Profit

Condensed from The Ohio Farmer

Earl Jones

EXPERIMENTAL work concerning returns from liming acid soils have been given wide publicity. Numerous farmers have observed the benefits of liming acid soils on their own or on neighboring farms.

There are, however, many factors concerned with the profitable use of liming materials which are not thoroughly appreciated. In many cases the applications of liming materials are not heavy enough to do a complete job, especially when coarse materials are used.

There is confusion concerning the comparative value of the different liming materials. The names of these different materials and the methods of identifying them are not clear.

The Ohio Lime Law requires that a written statement, giving the chemical and sieve analysis guaranteed, shall be furnished the purchaser of all bulk liming material sold in Ohio, regardless of whether the material is shipped from the quarry in trucks or railroad cars. For bagged materials the guarantees may be printed on the bag or on a tag or label attached to the bag.

Fineness is the only essential difference between the ground limestone products — limestone meal, agricultural ground limestone, pulverized limstone and superfine limestone. The percentage of material that passes through a No. 100 sieve definitely puts any ground limestone material in one of the above classes (See Table II).

The profit from liming depends on several important factors:

1. The liming applications necessary to prepare a soil for good stands of alfalfa mixtures or sweet clover should be made as soon as possible. Smaller applications do not raise the yield level to the maximum point. All the liming material needed may be applied at one time without any damage to crop yields.

2. Alfalfa mixtures are the most desirable sod crop when hay and rotation pasture are needed on the farm. Alfalfa alone may be more desirable where the hay crop is sold either for hay or meal. There is a place for one of the clovers for seed production on many farms.

Sweet clover is the best soil improvement crop where hay and rotation pasture are not needed.

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3. An adequate fertilizer program is necessary. Potash is now as essential a constituent of fertilizers as is phosphoric acid.

4. All sloping land should be farmed so that soil and water losses are reduced to a minimum.

5. The rotation should maintain and, on most farms, increase the productivity of the land.

When a field grows alfalfa mixtures and sweet clover satisfactorily, an application of one ton of agricultural ground limestone (or its equal) every four or five years will maintain this satisfactory condition. Good bluegrass pastures need one ton every six to eight years.

TABLE I

Corn Yields in Different Rotations with Light Liming and Complete Liming

Legume Reaction Test, Ohio Agricultural Experiment Station, Wooster, Ohio

AVERAGE YIELDS 1936-1944

	Crop Yields Corn Bu.	Acre Hay Tons
Corn-wheat-timothy		
Light Liming	59.6	1.44
Limed to Neutrality	72.5	1.99
Corn-wheat-red clover		
Light Liming	68.4	2.75
Limed to Neutrality	79.2	3.08
Corn-wheat-alfalfa		
Light Liming	72.5	2.28
Limed to Neutrality	85.8	3.50
Corn-wheat-alfalfa mixtures (alfalfa, clover, timothy)		
Light Liming	73.7	2.93
Limed to Neutrality	81.0	3.97

Basic treatment to all plots was 150 pounds 0-14-7 on corn and 300 pounds 0-14-7 on wheat. Manured plots received four tons on corn and four tons as top-dressing on wheat.

While the corn and hay yields are excellent at optimum soil reactions, there is some evidence that fertilizer rates have been inadequate for maximum yields during the recent highly favorable growing seasons. The good response to manure tends to substantiate the belief that soil potash reserves are being exploited at a dangerously high rate.

Note that the corn yields increase as the hay yields increase. Corn yields probably indicate the productivity of the land more accurately than do yields of any other common field crop.

TABLE II

Equivalent Applications of Different Liming Materials — Four-Year Basis

Average of Calcium and Dolomitic Limestones

(Agricultural Ground Limestone = 100)

Material	% thru #100 sieve Pct.	Amt. req. to = 1 ton Agr'l grnd. limestone Lbs.
Coarse agr'l limestone meal	20-29	2900
Fine agr'l limestone meal	30-39	2400
Agr'l ground limestone	40-59	2000
Agr'l pulverized limestone	60-79	1700
Agr'l superfine limestone	80-100	1600
Hydrated lime (TNP=135)	100	1200
Hydrated lime (TNP=165)	100	1000

Heavier applications of screenings and other materials containing less than 20 per cent through a No. 100 screen are necessary. These materials are variable in fineness and it is difficult to name one figure for them.

Most commercial ground limestone materials have a neutralizing power around 100 and their fineness.

Many farmers do not make the necessary heavier applications of the coarser materials.

Legume Bacteria in Soil Conservation

Condensed from Soil Conservation

T. M. McCalla

MANY leguminous plants furnish a soil cover, reducing water and wind erosion of the soil. The use of kudzu in the South is an example of what a legume will do to stop erosion and rebuild soil fertility. Although some legumes, such as soybeans, do not give the soil much cover or protection against erosion, legumes in general supply available nitrogen and organic matter to the soil. This enables succeeding crops to grow better and furnish more cover. To grow legumes successfully and to realize the benefits of nitrogen fixation, a number of soil treatments and management practices are required. It is my purpose here to point out the role, behavior, and needs of legume bacteria in association with the legume plant in furnishing fertility for the growth of plants to make a soil cover.

On the roots of the legume plants are numerous nodules of various sizes and shapes, each acting as a nitrogen-fixing factory. In these nodules are millions of tiny, rod-shaped bacteria living in association with the plant tissue. The bacteria and plant tissue together are capable of taking atmospheric nitrogen and transforming it into an organic form usable by the plant. The bacteria not only perform this service gratuitously but also actually pay for the privilege. The exact nature of this wonderful mechanism is not known, but recent research points the way to an early understanding of it. Industrially, atmospheric nitrogen is fixed at tremendously high temperatures and pressures. In the nodule, nitrogen fixation is accomplished at normal temperatures and pressures.

Reprinted from Soil Conservation, Washington, D. C., August, 1946

Legume bacteria are minute, rod-shaped organisms, in most instances. They are about 1/25,000-inch in diameter and 1/5,000-inch in length. They occur in morphological forms known as rods or normal forms, and in round or odd-shaped forms which are called "bacteriods." The exact significance of these bacteriod forms in nitrogen fixation is now known. The legume bacteria move by organs of locomotion called "flagella." Some have one flagellum while others have many. The legume bacteria move rapidly in liquid media, but it is doubtful that they move much in the soil by their own locomotion. Probably dissemination of legume bacteria is accomplished largely by wind, water, and insects.

The legume organisms are divided into two groups based upon their ability to grow on artificial media. One group grows rapidly and the other slowly. The rapid growers are represented by pea, bean, and alfalfa groups. The slow growers are represented by cowpea and soybean groups. The legume bacteria as a rule are prodigious gum formers.

The growth of legume bacteria may be inhibited by certain microorganisms, while other groups stimulate their growth. Legume bacteria grow well in a medium containing essential mineral elements, a source of carbon, and accessory growth factors from plants. They may be carried for long periods of time on this medium without losing their ability to nodulate legumes or to fix nitrogen.

One important question arises as to whether legume bacteria can fix atmospheric nitrogen in the absence of a host plant. Some investigators believe they can, whereas others think they cannot. However, at the present time the consensus is that the legume bacteria do not fix atmospheric nitrogen in the absence of the host plant. Thus, the replenishment of soil nitrogen by the legume bacteria unassociated with legume plants cannot be counted upon.

Legume bacteria are destroyed by direct sunlight and dessication. Since sunlight affects only those organisms in the immediate surface of the soil, the effect on the total number in the soil is negligible. Although they do not form spores, some of the legume organisms are able to resist drying for long periods of time.

Nodules are located on roots of legumes. They may be large and clustered about the tap root, as with soybeans or cowpeas. They may be scattered about on the lateral roots, as with alfalfa or vetch. They may be round, clustered, or oblong in shape. Enlargements on the roots or false nodules caused by nematodes do not fix nitrogen.

The root hairs are infected at an early stage. By the time the plants are 1 to 2 weeks old they may have a number of nodules fixing nitrogen. From this time on, the amount of nitrogen fixed per time unit increases in quantity. Intermittent periods of dry weather may cause the nodules to dry up with a cessation of fixation. Eventually, nitrogen fixation ceases as the plant matures. A considerable portion of the nitrogen fixed in the nodules is used by the plant in the growth process.

A legume plant nodulated with an efficient strain of bacteria has a dark green color and makes vigorous growth. The non-nodulated plant in a soil deficient in available nitrogen is yellow and stunted.

Legume bacteria are responsive to environment. In a medium deficient in lime the organisms may change to colored forms incapable of producing nodules. A liberal application of lime may cause the legume bacteria to become normal in color and nodulating ability. Lack of any essential mineral element such as phosphorus, potassium, boron, or others result in inefficient or no nodulation. Soil fertility conditions with respect to all elements except nitrogen should be corrected before legume seeds are inoculated and planted. A non-nodulated legume will not increase the total soil nitrogen. The manurial value of a legume without nodules would be the same as for any non-legume.

The value of a legume is based upon its ability in symbiosis with the bacteria to fix atmospheric nitrogen and to supply the nitrogen to the plant and the soil. Growing a legume that does not fix nitrogen will not result in better plant growth or soil improvement. The same results could be achieved by growing a non-legume.

Legumes may use available nitrogen from the soil and not fix atmospheric nitrogen. The process of nitrification may supply a considerable portion of the nitrogen needs of the legume. This may reduce the need for nitrogen fixation to a considerable extent.

Under some conditions it has been found advantageous to apply light applications of nitrogen to soybeans at the time of planting. The soybeans may benefit from the available nitrogen in the fertilizer or through nitrification before the nitrogen fixation process gets under way.

Sometimes the soil does not contain the proper legume bacteria. Under these conditions the seed should be inoculated with the proper group of organisms. Legume bacteria are divided into seven inoculation groups, name-

ly: (1) alfalfa, (2) clover, (3) pea, (4) bean, (5) lupine, (6) soybean, and (7) cowpea. Before the legume seed is planted, it should be inoculated with bacteria from the proper group. Land that has grown the particular legume recently probably will not need inoculated seed.

Either the seed or the soil may be inoculated. Usually it is less trouble to inoculate the seed. Seed inoculation may be accomplished by mixing the seed with soil known to contain the proper organisms, or with pure cultures of the organisms. Pure cultures are distributed on agar in bottles, on peat, or some other humus material. Any of the methods is satisfactory for the distribution and storage of pure cultures. If there is any doubt about the need, it is usually good insurance to inoculate.

When legume plants and bacteria are grown in a soil with adequate mineral nutrients present, 50-150 pounds of nitrogen per acre may be fixed annually. This is only a small amount of the total atmospheric nitrogen over an acre of land. The nitrogen fixed in the nodule is immediately available to the plant. Some of the nitrogen goes into the roots and some into the plant tops. Inoculation of the seed may increase crop yields considerably. The increase in yield will be dependent upon the presence of proper bacteria and the nitrogen available in the soil. In 1945 soybean yields in Nebraska were increased 3 bushels per acre by inoculating the seed, as shown by the Nebraska Grain Improvement Association.

The time of returning the legume to the soil is important in the use of the crop as a green manure. The plant material turned back to the soil decays and releases through nitrification the nitrogen taken from the air and the soil. The rate of decay and the release of available nitrogen depends on the succulence of the plant, the percentage of nitrogen, and the available carbohydrates. The nitrifying rate of the legume varies with the age of the plant. At an early stage of growth the plant is high in percentage of nitrogen. If sweetclover is plowed under when it is 12 to 16 inches high, the nitrogen is converted rapidly into nitrate. As the plant grows older the percentage becomes smaller, but the total plant material and, consequently, the total nitrogen increases.

Legume bacteria may change considerably after producing nodules on the plant for a season. At times legume bacteria may become more effective in nitrogen fixation by plant passage. Under other conditions, however, repeated passages through a host plant may result in successively

less effective strains, until after several passages, the bacteria may produce numerous nodules without fixing much nitrogen. Actually, plants inoculated with ineffective strains of bacteria may produce numerous nodules without fixing nitrogen. Because of this, the number of nodules on a plant cannot necessarily be considered as a criterion of nitrogen fixation. Usually a few large nodules clustered about the tap root indicate a plant that fixes large amounts of nitrogen.

Generally there is quite a large variation in the amount of nitrogen fixed by different strains of legume bacteria. Thus, it is necessary to see that the seed is inoculated with the most efficient organisms. If there is any question about the soil having good strains of legume bacteria, it is advisable to inoculate the seed with reliable cultures.

The legume bacteria are attuned to the level of nutrients used by legume plants and must have organic materials as a source of energy and carbon. Despite the exacting nutritional demands of these organisms, they may persist for several years in the soil in the absence of the host plant. If 10 years or more have elapsed since a legume of the same inoculation group has been grown on the land, the seed should be inoculated.

Legume bacteria do not produce nodules or fix nitrogen in soils too acid. However, the limiting pH ranges from 3 to 5 with the different groups of legumes. There is a close relationship between nitrogen fixation and calcium content, and a reciprocal relationship exists between nitrogen fixation and the hydrogen ion concentration of the soil. If the soil is deficient in lime, phosphorus, potassium, or boron, these fertilizers should be added to the soil before the legume is planted.

Legume bacteria have a disease called "bacteriophage." Under some conditions, bacteriophage may cause a cell destruction or disintegration of the nodule bacteria in alfalfa. When the bacteria are killed in this way, the nodules of alfalfa are rendered ineffective in nitrogen fixation, according to some investigators. Secondary growth of organisms or new strains introduced by inoculation may overcome this difficulty. There seems to be some question as to the magnitude of the bacteriophage in causing the deterioration of alfalfa stands.

Legume and nonlegume, such as alfalfa and bromegrass, grow together in certain localities so efficiently as to encourage the practice of planting them together. The beneficial association of legumes and nonlegumes seems to be other than the excre-

tion of nitrogenous substances by the legume-root nodules directly into the soil for the use of the nonlegume. Nodules or roots may decay during the period of growth or during the following year. The nitrogenous material may be transformed eventually to nitrates which will increase crop growth.

Legumes properly inoculated will fix atmospheric nitrogen, which in turn will feed plants with available nitrogen to furnish a soil cover for erosion control. The legume plant furnishes nitrogen not only for its own use but for the succeeding crop as well. This addition of available nitrogen induces the growth of more cover and protection to the land. Much of the benefit of legumes in soil erosion control comes from their influence on soil fertility, stimulation of succeeding crops or associated crops, such as bromegrass.

Waterways or eroded areas to be seeded to grass and legumes may need the addition of lime, phosphorus and potassium. The seed should be inoculated before planting to insure that effective nitrogen-fixing strains of legume bacteria are present.

Failure to obtain a good legume crop may be due to: (1) Lack of fertility elements, such as lime, phosphorus, boron or others; (2) inadequate cultural practices, such as improper seedbed preparation or poor cultivation; (3) lack of legume bacteria or the presence of inefficient strains. The answers to these difficulties are obvious. The soil fertility should be adequate or supplied. The land should be properly prepared, and the seed before planting should be inoculated with good strains of bacteria.

To assure maximum benefit of legume bacteria to the legume plant in a soil conservation program, all land management practices of merit—such as liming and tillage—that influence nodulation should be inaugurated and carried out. Proper nodulation with efficient strains can be obtained by using reliable inoculants. If these things are done, profitable plant growth and an adequate protection of the land against soil erosion should follow. In addition to adequate erosion protection, soil organic matter and nitrogen will be increased also.

Production Testing Values and Practices

Condensed from American Hampshire Herdsman

W. M. McMillen

Michigan State College

One prolific sow with enough udder sections and milking ability to raise 10 or more pigs can produce litters with as much weaning weight as 3 average sows. In the Michigan Sow Testing Project, conducted in 1945 by H. F. Moxley with records on 189 sows, the 10 high sows produced as much pig weight at 56 days as the 30 low producers. Similar results were recorded by G. P. Deyoe for 120 sows in Vocational Agriculture Projects in Michigan.

Records for the sows in our college herd also emphasize the large variation in the producing ability between strains as well as between individual sows. A low producing strain had an average of about 7 pigs born and less than 6 raised over a period of years. A more prolific strain, handled under the same conditions, farrowed an average of over 9 and raised about 8 pigs.

Not only do the prolific sows with good milking ability produce 3 times the weaning weight of average sows, but they are more profitable. It takes about 4 or 5 pigs at weaning time to pay the production costs. A sow that weans large litters produces her pigs with considerably less labor, equipment and feed cost per pig than the low producer.

Some still say they would rather have litters of 6 to 8 than to have the runts in larger litters. We find a few more runts in litters of 10 to 13, but our records do not bear out the idea that pigs in large litters average lighter at weaning time. It can be seen from summarizing the results of sow testing in Michigan that the average weight per pig is heavier as the number of pigs raised per litter increases. The pigs in litters of 5 and 6 averaged 26 pounds at weaning. The pigs from litters of 10 or more raised averaged over 40 pounds.

We realize that all the variation in these production records is not due to difference in producing ability. As a rule, the breeder or commercial hog man who raises large litters also takes better care of his hogs. Production testing has proven valuable in school and extension project

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work because improved breeding, feeding and management practices are all a necessary part of the program.

From our experience with production testing the past few years and after studying our production records, we have found the following points to be essential:

1. Start with high producing strains—It's foolish to keep sows that will farrow less than 8 pigs and raise less than 7 under good management. If you have an unprolific and poor suckling strain, the quickest and surest way to increase production is to discard the unprolific breeding stock and start with proven higher production breeding animals.

2. Watch those udders—A sow cannot raise a litter of 11, 12, or 13 pigs unless she has enough udder sections with teats properly spaced to accommodate that many. After having observed the production of many sows of high producing calibre, I do not think that it is at all impossible to produce strains that will consistently have 10 to 12 pigs and raise an average of 9 or more.

3. Care in selecting the herd boar for production factors—Three times in the author's experience a boar selected largely for type has wrecked our plans for production. In two cases the boars had only 11 teats, and since the back 2 were small and close together passed the equivalent of only 8 to 9 teats on to their daughters. Another boar with 3 blind teats passed 3 or more on to practically all of his daughters. A good many breeders are making slow progress because they fail to insist on boars out of high-producing dams that have at least 12 sharp, well-defined teats properly spaced.

4. Don't be impatient—One should realize when he starts production testing that progress is slow at best. We know from analysis of data concerning the heritability of production factors that one cannot expect to make rapid progress in increasing prolificacy and suckling ability. It has been demonstrated in several herds, however, that by consisent selections of boars and gilts out of large, heavy litters one can gradually increase the average number of pigs born and the suckling ability of the sows.

Replacements Mean Profits

Condensed from Southern Agriculturist

R. G. Connelly

Extension Dairy Husbandryman, Virginia

THE kind of calves we raise now will determine the kind of cows we will milk in the future. This is a truism that no dairyman can ignore without getting into perpetual difficulty.

A dairy cow lasts about five years in most herds. Every dairyman should be prepared to replace 20 per cent of his cows each year. Between New Year's Day and Christmas one out of every five stalls will be occupied by a new cow. This turnover of cows may be considered a heavy charge for one to pay just to keep the stalls in the dairy barn filled. But, considered from another standpoint, a dairyman's program of herd replacement can be made one of the most profitable departments of his whole dairy enterprise.

Regardless of his wishes, the dairyman must find replacements for his herd each year.

The best way to maintain a steady supply of healthy, high-producing and dependable herd replacements is by raising calves from the herd. In such a program the first requirement is that the herd be headed by the best registered bull obtainable. The limit of a calf's dairy possibilities is determined by the dairy qualities it inherits from its parents. Therefore, since one bull may sire many calves, the dairyman must give careful consideration to the genetic qualities of the bull he uses.

Good proved bulls are very scarce and usually expensive to purchase. Consequently, many dairymen are following a logical course by getting a young bull that is sired by a proved bull and out of a dam that is a high-record daughter of a proved bull. Of course, in this "next best" procedure of procuring a young unproved bull that will be proved eventually in the particular herd, the dairyman should give careful consideration to other factors when the young untried bull is selected.

It is a good idea to inspect the bull's sisters to see what kind of udders they have; to determine whether the cows are large, strong and of good body conformation; to determine whether the family

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is endowed with the traits that make them live longer than five years; to determine how persistently they milk and how regularly they drop strong, living calves; and above all, to determine whether the breeder of the calf stands four-square behind his herd or whether he is merely the "operator" of a herd replacement factory.

In other words, determine whether the near kin; the dam, the sisters and the aunts of the young bull are the kind of cows that will assure you the kind of herd that will mean tax-paying revenue.

The kind of bull one selects is vitally important—but in order to speed up the program of herd improvement by means of home-grown herd replacements, the dairyman must know a lot about his cows. He cannot operate his enterprise by remote control and hope to get ahead. He must work with his herd daily and, by intelligent observation and careful study, learn which cows have the richest inheritance of desirable dairy traits. These are the brood cows he is seeking—they will provide him with the best herd-building replacements.

Each breeder may have a fixed ideal of what he wants in a brood cow, but any dairy farmer certainly should want the dams of his herd replacement heifers to be large, strong, healthy cows; cows possessing excellent dairy quality and a good-plus breed type; cows that breed and calve regularly and milk persistently; cows that, given the feed and care, maintain a relatively high level of economical milk production.

Such brood cows have quiet dispositions; they live long; they milk easily; and they are not puny feeders or susceptible to every disease that comes along. When such cows are mated with the sons of similar cows, a farmer has an excellent chance of going ahead in his herd-building program.

In addition to working with his cows every day and keeping his eyes open, the dairyman must keep records. Usually a dairyman must raise three calves in order to get one superior herd replacement. Naturally, he wants to minimize his risk in the selection of calves at the start. Therefore, without regular and continuous production records on the whole herd, he cannot exercise sound judgment in determining which cow's calf should be raised.

Throughout the South, feed crop production has been greatly emphasized. The progress made in soil conservation, pasture and hay land improvement, seed production and crop adaptation have been nothing short of phenomenal in many localities. Now the $64 question is: "How can these

advancements be translated into human food, better farm income, higher standards of rural living?"

This question cannot be answered satisfactorily by feeding low-geared dairy cattle and other inferior types of livestock.

Not only will good records point out the profitable cows—they will also single out the submarginal ones that should be culled from the herd when milk prices decline.

Dusting Sheep

Condensed from The Dakota Farmer

R. L. Dushinske

TAKING much of the labor out of the job of controlling ticks on sheep, the Nelson County Sheep Dusting Association has forwarded beyond the experimental stage a revolutionary system which sheep raisers are lauding.

Dusting of sheep has proven economical, time-saving, and as effective as the traditional "dipping" of sheep to kill ticks, according to C. W. Wolla, Nelson County extension agent and organizer of the association of sheepmen.

Over 8,000 sheep have been dusted in Nelson County and Mr. Wolla estimates that the dusting machine, owned by the association, will have destroyed ticks on 15 to 20 thousand sheep, about one-half of the total sheep in the county, before the 1946 campaign is completed.

Taking his cue from an article in the "Extension Review," national publication of the extension service, on experiments conducted by Cornell University in dusting feeder lambs before they go on New York feeding lots, Mr. Wolla organized the sheep raisers and enlisted the aid of the extension agricultural engineer, and the extension entomologist.

A power potato duster, using added pressure, is the heart of the machine which has a flexible steel hose shooting the chemical through holes in all sides of a narrow chute through which the sheep are driven. It usually is set up at a narrow opening in a sheep barn with an additional chute inside for more uniform passage of sheep.

The machine's cost was approximately $561.00, to be paid from the receipts of the dusting.

Reprinted by permission from The Dakota Farmer, August 3, 1946

The charge this year is 10 cents for each ewe and five cents for each lamb, about half the usual dipping charge. Mr. Wolla estimates that the cost will be cut in half for those cooperating this year or until the initial cost for the equipment is paid.

Mr. Wolla said the initial experiments were on unshorn sheep and checks, at frequent intervals, proved the method as effective as dipping, which is a "messy task at best." Even more effective is the dusting after shearing, he explained, as there is less wool to penetrate. While some "nits"—eggs of the ticks—remain in some cases, their number is negligible.

Most effective chemical has been found by both Cornell University and Nelson County experimenters to be rotenone with a pyrox carrier or base.

"The big advantage is economy and speed as the operation is completed on as high as 1,200 sheep in a single day with one man operating the duster and owners driving the sheep through the chute," Mr. Wolla declared. "The time expended is about a tenth that used for dipping and does not require the manpower of the old method."

Mr. Wolla first compiles a regular schedule of farms and the operator follows with the machine. Eight to 10 farms are visited in a single day. Mr. Kaasa has dusted as high as 300 animals in 15 minutes when conditions are right, averaging only a little more than an hour on a farm, including the time needed to set up and dismantle the machine.

In addition, the machine which was constructed by the Agricultural Supply Company, Grand Forks, N. D., with Jack Harty as supervisor, has a "boom" for crop dusting when not used as a sheep duster.

Save Colostrum!

Condensed from Iowa Farm Science

MILLIONS of pounds of valuable milk are being wasted on farms each year because not all of the colostrum milk which cows produce immediately after freshening is saved.

Experiments carried on at Ohio State University have shown great value for colostrum and all that is being produced by that dairy herd is now being used. If cows freshen too rapidly to use the milk as it is produced, then it is frozen up, or processed.

In the tests with colostrum in Ohio, calves have been divided by sex and breed to enable making accurate comparisons of those on colostrum with those not fed colostrum. The calves on colostrum receive a part or all of their nutrition from colostrum. All of the calves have been fed grain and hay free-choice.

The calves receiving colostrum milk in the Ohio tests have outgained the check calves. And the check calves were getting whole milk in addition to hay and grain.

The Ohio men have found that if you feed 1 pound of colostrum for each 10 to 12 pounds weight of the calf, you will have no trouble with digestive problems. Calves receiving the colostrum milk have had better physical appearance in the Ohio tests. The calves on colostrum have been more alert and active and have had less trouble with scours.

The average cow in the Ohio State herd produces 75 pounds of milk—colostrum milk—in the first 3 days. A calf will use only about a third of this. If the rest of the milk were thrown away, it would mean a loss of 50 pounds per cow. For all cows in the United States, probably 540 million pounds of valuable feed are wasted each year.

Because of the high value found for calves in the colostrum milk, there seems a possibility that it may be found of great value for human consumption.

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Is It Coryza — Or Just Plain Roup?

Condensed from Poultry Tribune

J. P. Delaplane, D.V.M.

R. I. Agricultural Experiment Station

THE use of the word "coryza" is rather loosely employed by poultrymen and others to designate any infection which primarily involves the upper respiratory tract; that is the nasal passages and sinuses of chickens.

The writer has the impression that too much has been taken for granted, in that it has been assumed that the organism, Hemophilus gallinarum, which causes infectious coryza, has been responsible for most of the disease outbreaks. This confusion can readily be appreciated because of the similarity of symptoms and lesions resulting from infection of the respiratory tract with different causative agents.

In the Midwest and Southwest, the disease commonly referred to as "roup" probably constitutes the most widespread respiratory disease. This infection is characterized in most birds by a nasal discharge of pus, with a characteristic offensive odor. In some individual birds the sinuses and eyes are distended as a result of firm, cheesy accumulations in or around them. In some birds, the wattles and the skin under the lower beak may be swollen and distended. This particular type of disease is caused by an always-present form of the organism Pasteurella avicida, rather than by Hemophilus gallinarum, which causes infectious coryza.

Technically, the term infectious coryza has been accepted to designate the disease produced by the organism Hemophilus gallinarum. This infection also is characterized in the affected birds by nasal discharge, which does not have the offensive odor which is characteristic of the roup infection caused by Pasteurella avicida. The face of the bird may be swollen and the eyes closed as a result of it, but the swelling results from the filling up (edema) of the skin and underlying tissue with blood serum, rather than from cheesy accumulations in the nasal passages and sinuses as in roup. The wattles and skin under the lower beak also may be swollen and distended as with roup, so that a definite diagnosis will require the actual isolation and identification of the causa-

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tive organism in the laboratory. Symptoms of lower respiratory involvement, characterized by coughing and rattled breathing, may be observed with outbreaks of both infectious coryza and roup.

Fortunately, both diseases are easily eradicated from a farm by proper sanitary management programs. Both diseases require direct contact between infected or recovered "carrier" birds and susceptible ones. Neither the Hemophilus gallinarum nor Pasteurella avicida organism is capable of living for extended periods of time outside of the bird. *All that is needed to break the cycle of infection is to make certain that infected, or "carrier," birds never come in contact with the young replacement stock.*

This can be accomplished by brooding all young chicks completely out of contact with all old birds and by the disposal of all of the old flock when the pullets reach maturity. The laying house should be cleaned and disinfected before the pullets are housed. If old birds are to be kept over, it will be necessary to house the old and young birds separately and make sure they do not come in contact with one another.

Either disease will continue to result in deaths or prolonged periods of poor egg production, and will be carried on from year to year if such sanitay measures are not practiced.

No vaccines have been developed which are of value in preventing or controlling either one of these two diseases.

A few years ago sulfathiazole was found to be of value in preventing and treating infectious coryza produced by Hemophilus gallinarum, but this drug, as well as most of the sulfa drugs, is of no value in preventing or treating roup, caused by Pasteurella avicida.

Recent work at the Texas Agricultural Experiment Station has indicated that one of the sulfa drugs, sulfaquinoxaline (Merck), was effective in preventing the development of roup in chickens which had been inoculated under laboratory conditions. The drug, given at the rate of 1/10 percent or 1/20 percent in the feed, was about 90 percent effective in preventing symptoms of this infection; whereas, 95 percent of the infected, non-treated birds developed the disease in a severe form.

Birds which already showed the disease at the time treatment began were not benefited through the use of the drug, thus indicating it has very little or no curative value.

The drug has the ability to cause symptoms and lesions of toxicity, or over-medication, when fed to mature chickens continu-

ously for eight or nine days at the rate of 1/20 percent. Unless this toxicity can be overcome, its use under field conditions to prevent the spread of infection would not be encouraging. Recent work at the Rhode Island Station indicates the drug may be given safely by using it at the 1/20 percent level for three days, omitting its use for four days, and repeating the procedure, but it is not yet known whether such intermittent use will be effective in preventing infection.

The information obtained regarding sulfaquinoxaline is well worth while, even though it may prove to have no other value than in the laboratory, because here it can be used to good advantage in assisting in the diagnosis of upper respiratory infections of chickens. It also lends encouragement in that this means of approach might lead to something of value in the field.

Even if an ideal drug should be developed to prevent infection, such a drug would only be something to break the shock of losses until replacement stock could be reared under careful sanitary management practices and the disease thus eradicated from the farm.

In certain sections of the country, doubt still exists in the minds of some poultrymen as to the specific nature of these diseases. Some believe poor ventilation, which results in cold, drafty, or damp buildings, gives rise to the trouble. Others believe feed, particularly the lack of green feed, to be the cause of the disease.

While these things are of importance so far as the comfort and efficiency of production of the birds are concerned and may contribute to the rate of spread and severity of the disease in a flock, once the infection is present, they do not strike at the basic facts of the situation. Furthermore, as long as these basic facts are ignored, nothing can be accomplished in overcoming these diseases.

Science Comes to the Farm

Condensed from Nation's Business

Vernon Vine

THE up-to-date farmer who used to do a good job of spraying with arsenate of lead, and lime-and-sulphur, now does a better job with dichlorodiphenyl - trichloroethane. He worms his sheep with phenothiazine; kills weeds with a chemical mysteriously known as 2, 4-D, and considers the possible profits that may accrue when he can mix thiouracil in the feed he gives his steers.

These recent additions to agricultural lore give some indication of how far farming has come since the time when an intelligent farmer was simply one who rotated crops and kept account of production.

Talk of strange drugs that increase production of milk and butterfat, that make steers fatten months sooner and that make old roosters taste like young capons is heard wherever farmers gather.

Veterinarians are pumping sick cows full of penicillin as casually as they tap for bloat. Thousands of calves are being sired weekly from test tubes. Apple growers are spraying their trees with epsom salts, and in New England feed mixers are dropping microscopic pinches of cobalt into each sack of feed they blend, on good scientific evidence that cows need it.

Agriculture is becoming the beneficiary not only of tremendous new discoveries in its own traditional fields of research, but of discoveries in many relatively unrelated fields as well. War-stimulated investigations are responsible for some innovations. More are the result of research in many fields.

A rubber company, for example, seeking chemicals for new rubber products, has almost inadvertently produced two superior plant fungicides; an oil base to carry DDT, which eliminates some of the serious shortcomings of that otherwise almost magical bug-killer; and a considerably improved hormone weed killer.

Continued work in plant breeding, agronomy, agricultural chemistry, and plant and animal nutrition have added new varieties, new techniques, and new knowledge, all of which promise to make the farmer's land, livestock, and labor more productive than ever before.

Possibly the most important of recent scientific developments is artificial insemination. Used ex-

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perimentally on poultry, beef cattle, and even honey bees, it has taken firm hold in the dairy business. At present the rate of growth is limited only by the supply of veterinarians and trained technicians.

Artificial insemination makes it possible for any dairyman to breed his cows to bulls with production-proved ancestry at no greater cost, and often at far greater convenience.

The meaning is plain. As each succeeding generation of heifers, sired by these superior bulls, comes into production, the average milk production per cow will rise. Cost of milk production will fall.

A farmer who has to milk 20 cows to produce 5,000 pounds of butterfat a year can look forward to producing the same amount of butterfat with only 12 cows. Or he may, if he chooses, go on milking 20 better cows, and earn an income 40 per cent greater from them, to set a reasonably attainable figure.

It takes two years or more to get the increase in milk production from artificial insemination —the time it takes to raise a heifer to milking age. Far more dramatic—and now in the testing stage — are the results achieved by thyroprotein, a hormone discovered by two University of Missouri scientists. It has increased milk production 10 to 20 per cent in cows already producing. It also has done something never before accomplished. It has increased the butterfat content of milk as much as 25 per cent—from four per cent fat content to five per cent. By increasing both milk flow and the fat content of the milk, this drug has raised the butterfat production of cows from 20 to 50 per cent—and has done it almost overnight, at a cost of three cents per day.

A companion drug, thiouracil, slows down the action of the thyroid gland. Steers given this drug with their feed produce more beef in the same time than steers not so treated. Broilers given thiouracil gain more weight than untreated chickens.

Annual loss from insects, bacteria and fungi comes to a tremendous total. On major crops, insect damage alone is responsible for a yearly loss of $2,000,000,000; plant diseases and deterioration of stored products take a proportionate toll.

A Major War on Insects

Best known to the non-farming public of the new chemicals which may make sweeping changes in agriculture is DDT. Although it will not kill all insects—the boll weevil is a notable one that turns up its nose instead of its toes—DDT does kill so many that normally conservative entomologists have dared to speak of the

day when certain insects may be exterminated.

DDT comes at a time when the whole mechanism of spraying is undergoing radical change. Development of high-powered smoke generators for the armed forces, of high-pressure fog vaporizers, of new aerosol carriers (some of which kill insects and arachnids that DDT won't touch) makes it practical for farmers to use insecticides whose cost might be prohibitive if they had to be applied by former wasteful methods. Prior to the war, over $100,000,000 was spent by the American farmer for 300,000,000 pounds of spray concentrates and 700,000,000 pounds of dry dust to control pests on the farm. But so far only one-eighth of the crop acreage has been properly treated.

Almost as startling as thiouracil is DDT's effect on beef production. Beef cattle sprayed with DDT gained 50 pounds more in three summer months than unsprayed cattle. The reason: DDT kept them free of flies. The steers therefore ate more, and because they were quiet, did not run off so much flesh trying to get away from their tormentors.

A new find, but less publicized, is 666, still rare, but showing considerable promise in fighting a number of insects that resist DDT. New fungicides offer hope for greatly increased yields of certain crops. Sugar beet seed, treated with one of these new preparations, produces eight times as many healthy plants as untreated seed.

Plant growth inhibitors — including weed killers already familiar to city dwellers who have used them to rid their lawns of dandelions—already are producing startling results.

One, a chemical defoliant, is largely responsible for making the mechanical cotton picker a practical reality. This chemical, sprayed from airplanes over cotton fields shortly before harvest, causes the leaves of the cotton plant to drop. Thus the bolls ripen uniformly, and the problems of mechanical pickers gathering green cotton and leaves both are solved.

A similar chemical, sprayed on potato fields, kills the vines, if frost does not come early enough, thus eliminating secondary growth of potatoes. It also makes the harvesting easier.

Most widely known of the weed killers are the various forms of 2, 4-D (2, 4-dichlorophenoxyacetic acid). These preparations kill broad-leaved plants, but have little or no effect on members of the grass family. Because of this selective characteristic, they may have an important place in the production of such crops as wheat, oats, barley and corn.

The use of weed killers in com-

bination with fertilizers has achieved highly satisfactory results. A combination of cyanamid, urea and chloropicrin has cut the cost of weeding tobacco seed beds 90 per cent. Urea, 2, 4-D, and fermate, used in combination, have proved an effective weed killer in pastures, while stimulating the growth of grass at the same time. Sinox and ammonium sulphate, used together, not only are solving the weed problem in flax fields (one of the big reasons flax is not as widely grown as it might be) but have boosted yields as much as four to ten bushels per acre.

While some scientists are finding ways for farmers to grow more of their old crops, others are busy searching for new crops that may make the U. S. more nearly self-sufficient in production of raw materials, or that may relieve the pressure of surpluses on some crops we normally overproduce.

Among the newest is ramie (china grass), of which extensive acreages have been set out in Florida. An importation from southeastern Asia, it may provide a highly useful and versatile fiber for our cordage industry.

Research at Kansas State College suggests an alternative crop for the great sweeps of the southern plains. This research also illustrates the new importance researchers attach to industrial markets for farm crops.

The Kansas nomination is blackhull of kaffir sorghum, which may provide a more profitable use for hundreds of thousands of acres in Kansas, Nebraska, Oklahoma and Texas, now seeded to wheat. In announcing blackhull kaffir as a desirable crop, Kansas scientists reported that one 56-pound bushel contains 28.6 pounds of starch, superior to corn starch; 1.56 pounds of oil, equal to corn oil; .42 of a pound of wax, superior to beeswax, and 7.57 pounds of protein in 17.85 pounds of meal suitable for livestock feed.

Engineering, as applied to agriculture, is also working marvels to vastly broaden the scope of farm mechanization.

In Texas, American-made machines are unreeling the cocoons of silk worms. They are the first practical machines ever devised to do this traditional hand labor, and they may make possible a domestic silk industry sufficient to supply whatever market for silk remains after nylon and other synthetics have met most of the fine fabric needs of the nation. The Texans are optimistic, at least. They have set out thousands of mulberry trees to provide fodder for the worms.

The impact of the mechanical picker on the cotton crop has been widely heralded. Not so well

known are the other inventions which made its use practical. In addition to the chemical defoliant previously mentioned, these include mechanical choppers to thin the cotton, and weeders which kill weeds with a burst of searing flame.

One of the biggest splashes in the postwar machinery market will be made by redesigned "three-in-one" tillage tools. In principle they are not new. A machine that would plow, disc and drag, thus creating a seed bed in one operation, long has been a goal of machinery designers. Getting enough power to do the job has been their bugaboo. Now coming on the market are two types of these machines —some self-powered, others driven from the power take-off of the tractors that pull them. They promise not only important savings in labor, but better prepared soil for bigger crops.

Agronomists have been worried, ever since hybrid corn was developed, that the increased yields produced by the new seed would soon be lost because of the heavier drain on natural plant food in the soil. Engineers have designed new fertilizer applicators, to deposit commercial plant food at the plow sole at the time the soil is turned over. Other attachments, which will apply side dressings of fertilizer, have been designed to be used with cultivators. Production of such machinery, plus the growing awareness of mid-western corn growers of the need to fertilize their crops, makes the corn belt a new frontier for the fertilizer industry.

Lighting engineers also have promised farmers new products in the postwar years. Most notable is a forthcoming "germicidal-plus" lamp; a fluorescent-type lamp which combines the health-giving properties of sunlamps with the germ-killing function of germicidal lamps. Whereas earlier types of sunlamps could be used for only limited periods of time, lest harmful overexposure result, the newer type lamps can be burned continuously, without ill effects on animal life. Moreover, the lamps operate at lower wattages and have a longer life than earlier models.

Continuous chemurgical research is under way at the U. S. Department of Agriculture's four great regional research laboratories at Philadelphia, Peoria, Albany, Calif., and New Orleans. At the Peoria laboratory, where mass production methods for penicillin were developed, semi-commercial production of motor fuel from corn cobs is under way. A vision of America's vast automobile fleet being powered with fuel from grain has been perennial and popular. It will be ironic, but important, if the most practical fuel comes not from grain

at all, but from the core on which it grows.

Among the problems which apparently are yielding to scientific research is the one of how to reestablish buffalo grass on the grazing lands of the great plains. An omniscient nature, realizing there would be dry years, and perhaps many of them, on the plains, made buffalo grass seed a slow germinating affair, which might not sprout for years. Researchers, by alternately soaking the seed in weak solutions of saltpeter, and then refrigerating it, have speeded up its germination.

Another researcher, puzzling over the problem of how to sow light seed successfully from the air, has devised a method of incorporating seed and fertilizer in tiny mud pellets which can be spread economically from planes.

The rate at which agriculture is being mechanized has posed some peculiar problems to scientists in non-engineering fields. Sorghum, a crop which should lend itself to combine harvesting, has a nasty habit of falling down and lodging when it is ripe. Kansas plant breeders therefore set out to breed a sorghum which could be machine-harvested successfully. They have come up with a stiff-stalk variety.

Research in packing and processing farm crops not only may alter many food-buying habits of city consumers, but may have far-reaching consequences on the farms themselves.

Development of a cell-type pack for peaches, similar to the method used for packing eggs, may make possible wide distribution of tree-ripened fruits. Rapid expansion of quick-freezing processes is bringing about many changes.

Even the egg, which comes in nature's most perfect package, has not escaped attention. Oiling, 5-second boiling, and chemical shell treatment are among the processes developed for keeping eggs fresh from farm to frying pan. In Boston, an enterprising company has announced roasted eggs as a new food product. University of California scientists, trying to solve the problem of how to get eggs with whites of uniform consistency, have discovered that a 10-second exposure to high-frequency electric current stiffens even a watery white, so that when the egg is broken, the yolk stands up with the bold pop-eyed look so attractive to the housewife.

It remained, however, for an Oklahoma poultryman to give all of this scientific research the color that it needs. He fed his chickens harmless vegetable dyes, produced eggs with yolks gaily colored green or red.

In the field of practical fantasy, however, A. O. Smith Cor-

poration of Milwaukee, a manufacturer of unquestioned leadership, has designed a glass-lined metal silo, equipped with a mechanism which unloads the silage from the bottom, thus eliminating one of the dairy farmer's most irksome chores (climbing a silo ladder is no fun — especially when the farmer's knees begin to creak). The ultimate scientific touch to this silo is its color scheme—white on the north side, black on the south—to take advantage of the last bit of warmth from the winter sun, to keep the silage from freezing.

And just to prove that all scientific problems aren't solved through complicated laboratory research, Oregon State College researchers, discovering that many fruit trees in that state needed a touch of zinc, simply began driving zinc nails into the trees.

New Tick Smear

A new DDT-based smear makes it look as if the dreaded Gulf Coast tick may be on its way out.

The tick, which gets into the outer ear, eyelids, and around the base of the horns of cattle and sheep, paves the way for screw-worms. In some years 80% of the screw-worm cases are from this cause.

The smear will kill the ticks and prevent reinfestation for from three to six weeks. It will soon be on the market commercially, or it can be made on the ranch.

Here's what it is made of: 5% technical DDT, 47% rosin, 33% hercolyn (hydrogenated methyl abietate), and 15% dibutyl phthalate. To prepare the salve, mix the DDT and dibutyl phthalate, and stir or shake until the DDT is in solution. Place the rosin and hercolyn in another container, and heat slowly until the rosin is liquefied. Stir to prevent scorching.

When the rosin is liquefied, remove from the heat and cool to 125° or less, then add the dibutyl phthalate and DDT, and stir until thoroughly mixed. One gallon of the preparation will treat 125 to 150 cattle.

An other proved way of cutting tick damage is to mow pastures regularly. Tests show that mowing reduces tick numbers on cattle 75 to 85%.

—Farm Journal

New Breeds of Hogs

Condensed from Rural New Yorker

Jo Bjornson

TWO NEW hog breeds, practically tailor-made from specifications supplied by feeders, breeders and meat packers for perfect type, have been recently developed by Dr. L. M. Winters at the University of Minnesota. They are the now very well known Minnesota No. 1 and the newer Minnesota No. 2. Both of these new hogs combine the thrifty and fast gains of the pork type of hog with the quality of the bacon hog. Already packers have expressed their satisfaction with the quality of the meat of these new breeds, and soon Minnesota farmers will be raising the older breed, the Minnesota No. 1, on their farms extensively. Not only do these new breed lines offer a brighter future for swine producers, but they also offer encouraging possibilities when used in cross-breeding for commercial production.

The development of the new hogs began nine years ago when 13 of the state experiment stations started research work in inbreeding with the more important lines of hogs. The purpose of the project, still being continued, is to find better methods of breeding and of utilizing inbreeding, crossbreeding and selection in improving swine. These projects have been carried on as research work exclusively, and not as a demonstration or promotion. The Minnesota Swine Breeding Project has had over 12,000 pigs farrowed, and has fed out more than 7,000 of them in complete litter tests. The work at Minnesota was concentrated largely on inbred Poland-China lines, plus the newly developed lines, the Minnesota No. 1 and the Minnesota No. 2. To survive the highly selective research work, the lines developed or improved at Minnesota had to prove their superiority by a five-point yardstick: 1—The number of pigs born alive per litter, 2—ability to survive, 3—rate of gain, 4—economy of making gains, and 5—merit of product. The Minnesota No. 1 hogs passed all these tests with flying colors, and the Minnesota No. 2, a line which is only four years old, has given encouraging results.

By careful inbreeding and selection both the No. 1 and No. 2 have been purified to a higher degree than most of our established lines. The former is the result of the development of a

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line begun with a cross of the Tamworth and Landrace breeds. It has the meat-producing ability of the Landrace, a bacon type of hog originally imported from Denmark, with the prolificacy, suckling ability and excellent bacon quality of the Tamworth. The original stock was obtained first by crossing the two breeds and then backcrossing some of the offspring in the early work. In keeping with the modern trend for hogs, the Minnesota No. 1 has a streamlined shape. It is basically red but may have some black specks or spots. It has a longer body, shorter legs, large ears and longer snout than most of our common swine breeds. Actually the No. 1 has averaged one and one-half inches longer than some Poland-China stock used in another experiment. It also was two-thirds of an inch shorter of leg, but about one-half inch less in depth of body.

Fast and thrifty growth is a top advantage of this breed. The average hog must be fed 425 pounds of feed for every 100 pounds of gain. The Minnesota No. 1 has required an average of only 315 pounds for every 100 pounds of gain, which means a saving of 110 pounds of feed for every 100 pounds gain in flesh, better than 25 per cent. This new porker is also in the blue ribbon group in rapid development. Over an eight-year period, the Minnesota No. 1's averaged 32 pounds at 56 days, 107 pounds at 112 days and 211 pounds at 168 days. Some of them reached 200 pounds in 135 days, with the highest litter averaging 215 pounds in 145 days. When it comes to ability to bear large litters, the Minnesota No. 1 is also a big producer. The eight-year average for all litters is 9.28 pigs born alive per litter; in 1946 Spring farrowings at the University's experiment station at Grand Rapids, the Minnesota No. 1 averaged over 10 pigs per litter. This is one to three pigs better than other breeds. The sows, too, show improved milking ability over many other breeds. The better form of the No. 1 brings an improved dressing percentage. Packers have been well pleased with the length of side and belly (bacon) and loin, the quality of the belly cut, and the smaller amount of its fat. On a sample slaughter through a packing plant, 28 hogs had a warm dressing percentage of 81 per cent, and packers were impressed with the uniform side, thin skin, uniformity of back fat, thickness of flank and lightness of bone of this new breed of hogs.

As with every new development, the Minnesota No. 1 also has its critics. They have criticized the No. 1 for its lack of ham, but in comparative slaughter tests both yield and quality

of ham have been high. The explanation of this discrepancy between apparent and actual yield of ham is that most of their ham is obtained around the hips, which is desirable, and the No. 1 has considerable length of hip.

This new breed made its farmyard debut in 1944. About 125 males and 100 females were distributed to 30 cooperative purebred breeders. They began the production that eventually may stock many farms with this superior breed, and thus lead to greater pork profits. Its success soon led to the establishment of the other new line, the Minnesota No. 2, which was started in 1940 from a crossbred foundation, a cross of the Yorkshire with two inbred Poland-China lines. Since the No. 2 line is only four years old, it is not yet regarded as a finished product. Yet it is well enough along to have its major characteristics established rather well. It even has longer legs and a shorter body than the No. 1. Actual measurements show, however, that the No. 2 is longer than it appears on casual inspection. The No. 2 is spotted black and white with erect ears and has a slight dish to its face. It already has established itself as a high yielding, fertile line comparing favorably with the No. 1. Its rate of gain is almost as rapid as that of the No. 1, and like the No. 1 it has a high quality carcass, low in fat and high in lean meat. The No. 2 is also light boned and thin skinned.

Crosses between these two lines have given exceptionally good results. These crosses give an indication of what can be expected of these new inbred lines for commercial production. It is thought that the crossing of well established lines with both the new breeds will give the best results in commercial production. These crosses between inbred lines produce hybrid pigs and like hybrid corn their performance is outstanding. The crosses between the No. 1 and some of the inbred Poland-China lines have given exceptionally good results. Last year, pigs from these crosses averaged 215 pounds at 154 days, and made 100 pounds gain (weaning to finish) on 310 pounds of feed. In addition, they yielded beautiful carcasses. Crosses using the No. 2 hog have also been successful. Several crosses with the No. 2 have been used. Only one litter of the straight No. 1-No. 2 cross has been produced, but more are being raised this year. This one litter averaged 214 pounds at 145 days, and yielded carcasses very high in the more valuable cuts and low in fat.

Not only has the Minnesota Swine Breeding project led to the development of new and better lines, but it also has pointed the

way to better breeding methods. The experiments show that considerable progress can be made by individual selection for improvement in rate and economy of gain and in quality of carcass. On the other hand, painstaking individual selection with hogs has led to very little improvement in fertility and ability to survive. It is believed that for rapid improvement in fertility and ability to survive, line selections must be made. Then the lines that are low in these characteristics can be improved by making wide crosses with lines high in these qualities. This, in turn, should be followed by inbreeding and selection. One might think that the development of new lines would jeopardize the position of purebred breeders if the new lines become widely accepted — this is not necessarily true. In fact the Minnesota system of crossbreeding for more efficient pork production puts a premium on pure lines, whether they be new lines or improved inbred old lines. If utilization of inbred lines in crossbreeding becomes a general practice, the task of the purebred breeder of the future will be to produce purified stock for crossing, and to be used for the commercial sale of desirable crossbreds.

It must be fully realized that in order to obtain consistent results with any first generation crossbreds, it is necessary to continuously use the same types and strains which entered into the original parent cross. This means that they must not only look alike but must be similar for all internal inheritance factors. The only way this can be established is by careful selective breeding. Once such purebred animals have been obtained they can then be used for crossing purposes with the certain knowledge that they will always reproduce the desired results without fail.

For satisfactory crossbreeding work it is necessary to test all individuals, not once but many times, in order to establish the manner in which they will react genetically when mated with various strains and types. Such purified strains will be preferred in breeding programs of the future, because their offspring can be counted on to render an excellence of performance with more certainty than present methods of mating.

Club Steaks from a Beef Club

Condensed from Farm and Ranch

Ervin Hickman

NEAR Miles, Texas, in a progressive little farm community called Klattenhoff, is a bunch of fellows who believe in co-operating for community good. They have a beef club, for instance, that has been operating for twenty years. It is composed of a group of 32 farmers representing an equal number of families. The men who belong to Klattenhoff Beef Club operate a system whereby each family gets an average of 18 pounds of fresh beef per week. The club functions from March to November — 32 weeks.

It is a big business and is carried on in a systematic fashion. Since it was created strictly for community benefit, no one makes a profit. Likewise, the only money paid out goes to Willie Kiesling who acts as butcher and general dispenser of the meat. He receives $2.75 a week.

Each member kills one calf that averages about 275 pounds. This is done on Friday evenings and the carcass is carried to Kiesling who hangs it in his caliche-floored, screened-in building to cool. Early Saturday finds Kiesling doing his duties as a butcher and, as the club members arrive around sunup, he portions out their share of the meat. The farmer - butcher cuts out sixteen shares and each member is entitled to a half-share. The members alternate on receiving various portions of the carcass until each has received meat equal to a whole calf.

There is a balancing fund, so to speak, that operates within the community club, which balances the account of any member receiving more than his share of meat. This is how it works: Suppose a member slaughters a 275-pound yearling and during the season receives 290 pounds of beef. If that is the case, he pays into the central fund 20 cents per pound for all meat over the 275 pounds. The money goes to those members of the club who received less than the weight of the animal they killed. The chairman of the group, Herman Heinze, declares that quite often members get exactly the same as the weight of the calf they gave into the pool.

The 1945 records show that the beef club slaughtered and distributed 10,442 pounds of beef for the co-operative that year. That

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is a lot of meat these days when you think of the city people who stand in line for this precious commodity.

The club meets the second Friday of each February. On this occasion, numbers are drawn to determine the order of the slaughtering for members. At the same time, votes are cast on new or old members. During the year if a member fails to live up to the standards set by the organization, he stands a chance of being removed.

New Bindweed Control Plan

Complete eradication of bindweed in heavily infested fields by continuous cultivation requires 2 or 3 years and it is not always possible financially to keep an area out of production for that long. Agricultural engineers at the Nebraska College of Agriculture are developing equipment which has made it possible to raise half crops of corn in a 3 year period and at the same time eradicate the deep-rooted bindweed.

The cultivating machinery which has been used by the engineers, with modifications, for the last three seasons, was made by mounting a tool bar from a cultivator on the rear of a tractor. Three sweeps were fixed in the center of the bar and three varied-size disk wheels were used on each end of the bar. The sweeps keep the area between the rows well cultivated and the disk wheels next to the corn rows throw the dirt into the rows to cover up any bindweed. For 3 years corn was planted on the contour with 2 rows skipped between rows. The second year the corn was planted in the center of the space between the rows of the year before.

One year of this system reduced 100 per cent infestation to 18 per cent. By the end of the second year the infestation was down to patches in the field. The third year brought the weeds to the point where engineers thought spot treatment of individual plants by hand removal could be done in a short time to completely free the field from the weed. Handwork was also necessary where washes prevented cultivating equipment from doing the job.

Advantages of this system are the half crops each year, which not only give a return but also better protection against soil blowing than if bindweed was being killed by alternate cropping and fallowing. Also use of the equipment as designed results in an automatically terraced field.

—*Capper's Farmer*

Science Goes Overseas

UNRRA has a crew of agricultural experts at work in four southern European countries showing farmers how to produce more food from their drought and war devastated acreage, F. H. LaGuardia, Director General of the United Nations Relief and Rehabilitation Administration reports.

"It's our first job to lick immediate hunger and famine now covering a good part of the world, but we've also got to look ahead. There's not much use in keeping a man from starving today if he's going to be without food next November and December. We've got to see that the people we're feeding now are raising every bit of food they can from this year's crops in their own lands."

Referring to the UNRRA agricultural experts as "famine fighters" Mr. LaGuardia said that they were sent in response to requests from UNRRA countries eager to put modern science to work in the war against hunger. He pointed out that in recent years under the lash of higher production goals, the United States and other non-invaded nations made great advances in agricultural sciences. According to Mr. LaGuardia, the job of the famine fighters is to take this know how to European farmers who have suffered a blackout of new ideas during the long years of occupation. However, he predicts better farming methods introduced by them will only compensate in part for war lost draft animals, lack of fertilizer and other handicaps to the speedy recovery of normal food production.

Headed by Hugh G. Calkins, of Albuquerque, New Mexico, UNRRA's crew of famine fighting experts, consisting of an assistant, a veterinarian, a specialist in range management, an irrigation engineer, a seeds expert and several farm machinery men is concentrating attention in Yugoslavia, Greece, Italy and Albania where drought sliced last year's yields, and baked, pulverized and eroded the grass lands.

Mr. LaGuardia also stated that UNRRA's agricultural rehabilitation program in European countries receiving assistance is expected to stop with the withdrawal of the agency's forces in December, and that the cooperating governments are asking for guidance in continuing their own agricultural rehabilitation efforts beyond the UNRRA period. The technical experts will help them plan this transition, he said.

—United Nations Relief and Rehabilitation Administration

Safer Farming

Condensed from The Michigan Farmer

F. W. Roth

Farm Safety Specialist, Michigan State College

BETTER living on the farm is the great unfinished business of American agriculture. This basic industry must produce not only essential food and fiber, but it must be the basis for a rich and satisfying family life for about 26 million farm people in the United States.

American farms need many things to increase the enjoyment of farm living, and to attract capable, trained youth into the farming business.

The huge accident toll suffered by farm people is one of the big obstacles in the road leading to a richer and fuller farm life. Last year over 16,000 farm residents met accidental death, and another 1,500,000 were injured. The exact costs of medical expenses, lost time, replaced labor, and reduced efficiency resulting from all these accidents can probably never be computed, but it is safe to say they total many millions of dollars annually.

A survey in several Ohio counties showed that the average cost per farm accident was over $100, and an average of one out of 12 farm families suffered a serious accident. In Wisconsin, a similar survey indicated that one out of every nine full-time operated farms was the scene of a work accident resulting in lost time and medical expenses.

Thus it is seen that a substantial part of the farm income which might be used in making improvements for better living is lost every year.

The record of agriculture in producing food during the war is known to all, but its accident record is not as commendable. More workers in agriculture are accidentally killed each year than in any other industry. The city cousin working in the factory is almost three times safer. Why is this so, you ask? What has happened to make agriculture three time as hazardous as manufacturing? The answer, I think, lies largely in the fact, that safety education has not been applied to agriculture as it has to industry, and certainly hasn't kept pace with the mechanization of agriculture.

For years, industry has recog-

Reprinted by permission from the Michigan Farmer, Detroit, Michigan, July 20, 1946

nized the seriousness of work accidents in their plants, and they have spent billions of dollars and much time and energy correcting the conditions which caused accidents. Corrective action generally consisted of providing better lighting, ventilation, guards on machines, and rearranging the work to eliminate hazardous operations. In addition, the worker is taught to operate his machine safely, and constantly reminded to avoid accidents.

For those who doubt that accidents can be prevented, records of some of these industries should be examined. One power company, for instance, has this record of improvement. In 1913, their accident record on line construction work showed that they lost one man in a fatal accident for every 50 workers employed on that phase of their work. In 1943 (30 years later) on this same job of line construction, they lost only one out of 1400. In other words, the same job subjected to study and action had become almost 30 times safer for the worker.

Heretofore, we have given very little general thought to accident prevention on the farm, and in the farm home. For that reason, we have allowed industry to make progress in the saving of human lives when sometimes we have improved crops and livestock, but have not spent much energy in accident study and prevention.

Specialized machinery has helped reduce accidents in industry. Should not the specialized machinery of agriculture contribute to safer farming? It should and can.

Certainly, the tractor is inherently safer, when properly operated, than the horse; yet, 15 farmers were killed and 16 severely injured in tractor accidents in Michigan from April 1 to June 15. What is needed is not fewer tractors, but a better understanding by tractor operators of the dangers and the precautions which must be taken to avoid an accident. Children and inexperienced operators must be carefully instructed and closely supervised. Most farm tractors have a high center of gravity and tip more easily that is generally recognized. Excessive speed, and working too near ditches and gullies are the principal reasons for tractors overturning. Hillside operations call for extreme caution, and wide wheel settings provide greater safety. Several of the tractor fatalities this spring were children who fell from a moving tractor and under the implement following. If you would do right by your children don't let them ride on the tractor or implements being pulled.

Power take-off shafts will maim and kill several people this

harvest season, but only because the guard was not kept in place.

Keeping the guards in place applies equally to corn pickers, corn shredders, combines, saws, and any machine which has gears, belts, pulleys, and chains. Gloves and loose clothing are easily caught in this equipment unless great care is exercised.

Livestock ranks second as a cause of farm work accidents. In a two and a half month period this past spring six Michigan farmers lost their lives due to runaway and kicking horses, and one was killed by a bull whom he trusted. These accidents can only be prevented by following the oft-repeated rules of conduct when working with farm animals. Keep the harness and equipment in good repair, and avoid startling animals by speaking to them to let them know your presence. The herd sire can never be trusted. This is a truth which is almost gospel. If you must lead him, do so only with a strong bull staff.

Accidents in this connection with the farm work, however, are not the only ones, or the most numerous. By far, the largest number of accidents to farm people occur in and around the farm home. Falls of one kind or another head the list of home accidents in nearly every survey. Most falls occur on stairways and steps. Slippery floors and rugs are the downfall of many persons. Broken or weak steps are an invitation to a broken leg, and stairways are a poor place to store toys, shoes, boxes, cleaning equipment, or anything else. Good lighting and at least one strong handrail make any stairway safer. Small rugs which slip easily are a real hazard, and have caused many nasty falls. They should be eliminated, or backed with non-slip material. Climbing on chairs, boxes, and furniture is responsible for many falls. A good stepladder is cheaper than mending a broken arm.

Watch That Kerosene Can

Another cause for many home accidents is burns and explosions. If people realized the danger of using kerosene to start a fire they would never bring a canful in the house, and pour directly from it in the stove. During April and May, eight farm people in Michigan were killed, and a number of homes burned when fires were started with kerosene. Dipping some kindling in a small can is so much safer.

The danger of dry-cleaning with gasoline cannot be overemphasized here, and all home dry-cleaning — whatever fluid is used — should always be done out of doors. Gasoline vapors may be exploded by static electricity when fabrics are rubbed together, or by a flame some distance away.

nized the seriousness of work accidents in their plants, and they have spent billions of dollars and much time and energy correcting the conditions which caused accidents. Corrective action generally consisted of providing better lighting, ventilation, guards on machines, and rearranging the work to eliminate hazardous operations. In addition, the worker is taught to operate his machine safely, and constantly reminded to avoid accidents.

For those who doubt that accidents can be prevented, records of some of these industries should be examined. One power company, for instance, has this record of improvement. In 1913, their accident record on line construction work showed that they lost one man in a fatal accident for every 50 workers employed on that phase of their work. In 1943 (30 years later) on this same job of line construction, they lost only one out of 1400. In other words, the same job subjected to study and action had become almost 30 times safer for the worker.

Heretofore, we have given very little general thought to accident prevention on the farm, and in the farm home. For that reason, we have allowed industry to make progress in the saving of human lives when sometimes we have improved crops and livestock, but have not spent much energy in accident study and prevention.

Specialized machinery has helped reduce accidents in industry. Should not the specialized machinery of agriculture contribute to safer farming? It should and can.

Certainly, the tractor is inherently safer, when properly operated, than the horse; yet, 15 farmers were killed and 16 severely injured in tractor accidents in Michigan from April 1 to June 15. What is needed is not fewer tractors, but a better understanding by tractor operators of the dangers and the precautions which must be taken to avoid an accident. Children and inexperienced operators must be carefully instructed and closely supervised. Most farm tractors have a high center of gravity and tip more easily that is generally recognized. Excessive speed, and working too near ditches and gullies are the principal reasons for tractors overturning. Hillside operations call for extreme caution, and wide wheel settings provide greater safety. Several of the tractor fatalities this spring were children who fell from a moving tractor and under the implement following. If you would do right by your children don't let them ride on the tractor or implements being pulled.

Power take-off shafts will maim and kill several people this

harvest season, but only because the guard was not kept in place.

Keeping the guards in place applies equally to corn pickers, corn shredders, combines, saws, and any machine which has gears, belts, pulleys, and chains. Gloves and loose clothing are easily caught in this equipment unless great care is exercised.

Livestock ranks second as a cause of farm work accidents. In a two and a half month period this past spring six Michigan farmers lost their lives due to runaway and kicking horses, and one was killed by a bull whom he trusted. These accidents can only be prevented by following the oft-repeated rules of conduct when working with farm animals. Keep the harness and equipment in good repair, and avoid startling animals by speaking to them to let them know your presence. The herd sire can never be trusted. This is a truth which is almost gospel. If you must lead him, do so only with a strong bull staff.

Accidents in this connection with the farm work, however, are not the only ones, or the most numerous. By far, the largest number of accidents to farm people occur in and around the farm home. Falls of one kind or another head the list of home accidents in nearly every survey. Most falls occur on stairways and steps. Slippery floors and rugs are the downfall of many persons. Broken or weak steps are an invitation to a broken leg, and stairways are a poor place to store toys, shoes, boxes, cleaning equipment, or anything else. Good lighting and at least one strong handrail make any stairway safer. Small rugs which slip easily are a real hazard, and have caused many nasty falls. They should be eliminated, or backed with non-slip material. Climbing on chairs, boxes, and furniture is responsible for many falls. A good stepladder is cheaper than mending a broken arm.

Watch That Kerosene Can

Another cause for many home accidents is burns and explosions. If people realized the danger of using kerosene to start a fire they would never bring a canful in the house, and pour directly from it in the stove. During April and May, eight farm people in Michigan were killed, and a number of homes burned when fires were started with kerosene. Dipping some kindling in a small can is so much safer.

The danger of dry-cleaning with gasoline cannot be overemphasized here, and all home dry-cleaning — whatever fluid is used — should always be done out of doors. Gasoline vapors may be exploded by static electricity when fabrics are rubbed together, or by a flame some distance away.

Many people also die each year in burning homes, particularly when trapped on the upper floor. Have you ever considered how you would escape from the upstairs of your home? In case of fire on the first floor, the stairway is generally useless because of hot gases and smoke which rush up, as if in a chimney, as soon as the door is opened. It's a good idea to have another way out.

Last year, 65 persons were fatally injured in Michigan by the careless use of firearms, and many of these accidents resulted from the demonstration of souvenir weapons brought home by returning servicemen. This type of accident can be prevented by following the old rule of "NEVER pointing a gun at anything you do not wish to shoot." When children use toy guns in play and simulated battle, they are not learning to respect this safety rule.

The farm accident picture, however, has a brighter side. It is generally agreed that at least 90 per cent of the accidents can be prevented. The causes of accidents are many and varied, but in general they can all be grouped in one of the following three ways. Accidents are caused either by (1) an unsafe act, (2) an unsafe condition, or (3) a combination of the first two. The tractor operator who drives at high speed and the person who pours kerosene in the stove, are performing unsafe acts, while a broken porch steps, a coin behind a fuse or a cracked and dirty chimney are examples of unsafe conditions.

Accident prevention on the farm then, is simply a matter of avoiding the performance of unsafe acts and correcting the unsafe conditions. The first point involves a change in work habits, while achievement of the second point requires going over the farm and home with a critical eye to discover hazards, and following that with corrective measures to eliminate the dangers.

If every farmer and his family will do these things—not only during Farm Safety Week, but every week—he will contribute greatly to the efficiency of agriculture and better living on the farm.

Small children are often the victims of burns and scalds when they pull pans of hot liquids down from the stove or table. Turning the pot handles away from the front, and keeping the children in a play pen will minimize this danger.

Pond Management for Fish

Condensed from Better Crops

Verne E. Davison

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POND management is much simpler than most folks imagine. There are a dozen ways to mismanage a fishpond, and some ponds cannot be well managed. In either case the wrong techniques are more complicated and more difficult than the few essential practices which produce good fishing.

Since 1941, soil conservationists in the Southeastern Region of the Soil Conservation Service have encouraged owners in pond management for fish. Most of these ponds are a source of good satisfaction, pleasure and good food.

We have studied dozens of ponds that were constructed, stocked, fertilized, fished, and otherwise managed as a part of the soil and water conservation activities of farmers who are cooperators of soil conservation districts. Even soil conservationists at first had their doubts relative to these surprising techniques, developed by Swingle and Smith, Alabama Agricultural Experiment Station. The technicians and farmers were entitled to doubts until they had living proof in their own communities; but the time for mistakes and doubt has just about run its course in the Southeast. Almost every technician who began pond work as long as two or three years ago now can point to many successful farm fish-ponds for each disheartening example.

Introducing a new set of water management techniques certainly has its trials. Our technicians encounter the full barrage of questions and arguments about fish management—for old ponds as well as new. A few folks honestly admit, "I don't know anything about managing fishing waters, but I like to fish." You would think, however, from the freely given advice handed out over the counter and from the barber's chair, that a fishing license is generally regarded as a permit for the professional practice of fish culture.

It has been fun to dip a minnow seine in the shallow edges of hundreds of ponds from Virginia and Kentucky south to Mississippi and Florida and show the

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surprised owners and our own technicians the simple, easy ways to tell what most ponds need in management. Few people really know what conditions exist within their ponds. Everyone seems concerned to protect the little fish from snakes and birds and turtles and bass which would take anything less than the "big ones."

Offered here is a list of five essential, easy things that must be done to have the best fishing in farm ponds.

1. It is essential to protect each pond from muddiness and too much water. This can be done best by selecting a site on a small drainage area and keeping it well vegetated to prevent erosion. In many situations the pond can be given additional protection with a diversion ditch to carry excess water around. Pond management is chiefly water management where fertilization is a hopeless task if the pond continually refills with fresh water and washes out that which has been fertilized. The construction must be as water-tight as possible, and safe.

2. It is essential to keep a pond free from weeds, grass, brush, trees, and other debris or obstruction. Fishing will be more pleasant and successful. More of the fish will be large enough to use. The pond area, therefore, must be cleared completely before water is impounded; and shallow water should be eliminated to avoid troublesome weed growth.

3. It is essential to fertilize pond water. Submerged water weeds and mosquitoes can be kept out in this way. Fertilized waters produce a heavy yield of fish and make fishing more successful. Mineral fertilizers to make up the equivalent of 500 to 1,500 pounds of an 8-8-4 are required per acre annually. Without nitrogen, phosphorus, and potash, a pond will be no better than ordinary. And organic fertilizers like barnyard manure will not do the job as well.

4. It is essential to begin with approximately 100 bass and 1,000 to 1,500 bluegills per acre. More are too many. A few adults won't do, and no other kinds of fish have been managed very successfully in small farm ponds.

5. It is essential that a pond be fished—removing usable fish by hook and line—without regard for spawning season, size, kind, or numbers. The number of pounds removed will govern the number of pounds produced. The food, formerly consumed by those caught, then becomes available to those remaining. The fish themselves will limit the angler's catch, leaving a big margin of safety in breeding stock.

To summarize: These five essentials will produce excellent fishing without any other measures. To make each pond manageable requires a little common

sense when selecting sites and constructing the reservoirs. Management requires a reasonable amount of work and expense to apply fertilizer and control vegetation around the pond edges. It is important, therefore, that effort and thought be concentrated on the essential things and not dissipated on the unnecessary or incorrect practices, several of which are listed as follows:

1. Stocking a well-fertilized pond with less than 100 bass per acre is wrong. Any Southern pond without bass is no good. Stocking with adult bluegill in numbers substantially below 1,000 per acre is wrong (if the pond is to be well fertilized).

2. Stocking ponds with crappie, catfish, or any species other than bass and bluegills is not likely to produce continuous fishing. No other combination is as simple to manage as bass and bluegills, and experimental results have proved no combination of fish as successful.

3. Brush and trees in a pond neither increase the fish nor make fishing better. Sand, gravel, or rock piles for spawning are entirely unnecessary. Pond fish will spawn adequately without them.

4. Addition of golden shiners, gizzard shad, top minnows, and other "bass food" is unnecessary. The small bluegills and bass provide adequate food and will eat all mosquito larva.

5. Screens across spillways are dangerous and largely unsuccessful. Little fish washed out even in great numbers are of no consequence — there will be that many more produced. Large fish go out only with deep flows through spillways — a condition avoidable by making wide spillways that spread the overflow thin (no more than 3 to 6 inches deep) and by avoiding flood waters, either by diversion ditches, or still better, by selecting sites on small watersheds.

6. Kingfishers, herons, fish ducks, and other birds have no material influence on fish in farm ponds. They eat only little fish of which every pond will have plenty. Only in hatcheries where thousands of fingerlings are kept in relatively little water are such birds undesirable.

7. Planting of water lilies, mosses, or other water weeds is, of course, detrimental. More fish are produced in weedless ponds than in those that are weedy.

8. Running water to "keep it fresh" is unnecessary. The plant and animal life, together with the sunlight, maintain a healthful condition for fish, livestock, and people even in waters remaining without "fresh" water entering.

9. Leaving stumps or putting wire, posts, broken glass, and other impediments in ponds to "keep some so-and-so from seinin' all the fish out" makes wading,

swimming, and fishing unpleasant. Very few ponds can be seined heavily enough to reduce the brood stock substantially. Depth is usually sufficient guarantee against harmful seining.

10. Draining a pond to "dry it out for weed control" is not successful. Weeds that live beneath the surface can be killed and kept out with shade resulting from the dark green coloration of fertilized water; the roots of water lilies can be exhausted by cutting the leaves as they reach the surface of the water (several cuttings are necessary as exhaustion proceeds slowly); and cattails and similar "edge-weeds" can be kept under control by pulling them occasionally as they appear. Bluestone (copper sulphate), calcium arsenate, and other chemicals are less desirable for weed control as some weeds are not harmed substantially. Chemical poisons kill fish foods too, and the "successful" results are but temporary.

11."Feeding" with stale bread, grain, or other foods is less efficient than fertilized and contributes little to the poundage of fish when fed in the small quantities usually given. Five or ten pounds of such foods will probably produce one pound of fish—to add to the 500 pounds per acre supported in fertilized water.

12. The use of manures, cottonseed meal, hay, or other organic fertilizers is not so successful or productive of fish as inorganic chemical elements. Organic materials support the undesirable pond scums.

13. Closed seasons or "protected areas" are quite unnecessary in conservation of pond fish. In fact, the spawning beds of bluegills should be located and heavily fished if a high yield is to be harvested. It is foolish fear to refrain from catching fish whenever they will bite.

14. It is not necessary to fish the bass and bluegills in proportion to the original stocking for the purpose of keeping a balance. The bass will maintain a correct balance whether the owner takes only bass or only bluegills. To enjoy full use and to harvest the usable surplus, however, both bass and bluegills should be fished; the possible yield is approximately three pounds of blue gills for every pound of bass.

15. A narrow belief has been built up by contests and sports-lore that "catching the big ones" is the foremost (and, to some, the only) objective of fishermen and fish producers. To a size-hungry fisherman, one should suggest the Gulf of Mexico or either of the two oceans bordering the United States. Now that pond owners know how to produce more fish, it is time to recognize as "master fisher" he who can produce the most pounds of fish per acre and catch delightful strings of fish.

FOR THE FARMER'S LIBRARY

These books are recommended as outstanding in their field:

A Living from Bees—By Frank C. Pellett, Field Editor of American Bee Journal. Orange Judd Publishing Co., Inc. $2.25.

America's Garden Book—By Louise Bush-Brown and James Bush-Brown. Charles Scribner's Sons. $3.50.

An Agricultural Testament—By Sir Albert Howard, C.I.E., M.A., former Director, Institute of Plant Industry, Indore. Oxford Univ. Press. $3.50.

Animal Sanitation and Disease Control—By Dr. R. R. Dykstra, Dean, School of Veterinary Medicine, Kansas State College. The Interstate Printers and Publishers. $3.50.

Beef Cattle Production in the South—By D. W. Williams, Head, Department of Animal Husbandry, A. & M. College of Texas, College Station, Texas. The Interstate Printers & Publishers. $2.50.

Breeds of Livestock in America—By Henry W. Vaughan, formerly Prof. of Animal Husbandry, Iowa State College. College Book Co. $4.75.

Dairy Cattle Feeding and Management—3rd Edition—By H. O. Henderson, Prof. of Dairy Husbandry, W. Va. Univ., Carl W. Larson and Fred S. Putney. John Wiley & Sons, Inc. $4.50.

Dairy Science—By W. E. Petersen, Ph.D., Assoc. Prof. Dairy Husbandry, Univ. of Minn. By R. W. Gregory. J. B. Lippincott Co. $4.00.

Diseases and Parasites of Poultry — By Edgar Hugh Barger, D. V. M., Berkeley, Calif., and L. E. Card, Ph.D., Prof. of Poultry Husbandry, Univ. of Illinois. Lea & Febiger. 3rd Edition. $3.75.

Farmers of the World—The Development of Agri. Extension—edited by Edmund deS. Brunner, I. T. Sanders, Douglas Ensminger. Columbia Univ. Press (1945). $2.50.

Farm Management—By Robert R. Hudelson. The Macmillan Co. $2.50.

Farm Management and Marketing—By V. B. Hart, M. C. Bond, L. C. Cunningham, all of N. Y. State College of Agriculture, Cornell University. John Wiley & Sons, Inc. $2.90.

Farm Records—by John A. Hopkins, Ph.D., Asso. Prof. Economics, Iowa State College. Iowa State College Press. $3.00.

Feeds and Feeding—By F. B. Morrison, Prof. of Animal Husbandry and Animal Nutrition, Cornell Univ. Morrison Press. $5.00.

Forestry in Farm Management—By R. H. Westveld and Ralph H. Peck. John Wiley & Sons, Inc. $3.00.

Grow Your Own Fruit—By M. G. Kains, formerly U. S. Dept. of Agri.; Prof. of Horticulture, Penna. State College. Greenberg, Publisher. $3.50.

Growing Tree and Small Fruits—By H. B. Knapp, Director, State Institute of Applied Agri., Farmingdale, L. I., N. Y., and E. C. Auchter, Chief, Bureau Plant Industry, U. S. D. A. John Wiley & Sons. $2.75.

How to Raise Rabbits for Food and Fur—By Frank G. Ashbrook, Fish and Wildlife Service, U. S. Dept. of the Interior. Orange Judd Publishing Co., Inc. $2.00.

Judging Dairy Cattle—By Edwin S. Harrison, Professor of Animal Husbandry, Cornell University. John Wiley and Sons, Inc. $2.75.

Livestock Production—By Walter H. Peters, Chief, Div. of Animal and Poultry Husbandry, Univ. of Minn. McGraw-Hill Book Co., Inc. $4.00.

Livestock Judging Handbook — By Julius E. Norby and W. Malcolm Beeson, Ph.D., Asst. Professors Animal Husb., Univ. Idaho. The interstate Printers. $3.25.

Modern Agricultural Mathematics—By Maurice Nadler, B. S., A. M., Dept. of Mathematics, Newtown High School, Long Island. Orange Judd Publishing Co., Inc. $2.00.

Modern Farmers' Cyclopedia of Agriculture—By Earley Vernon Wilcox, Ph.D., formerly U. S. Dept. of Agri. Orange Judd Pub. Co., Inc. $4.50.

Natural Principles of Land Use—By Edw. H. Graham, Chief of Biology Div., Soil Conservation Service. Oxford University Press. $3.50.

Pay Dirt—Farming and Gardening with Composts — By J. I. Rodale. Devin-Adair Co. (1945). $3.00.

Pleasant Valley — By Louis Bromfield, author, farmer, soil conservationist. Harper and Brothers. $3.00.

Pork Production — By William W. Smith, Prof. of Animal Husbandry, Purdue Univ. The Macmillan Co. $3.75.

Poultry—By A. R. Winter, Asst. Prof. Poultry Husbandry, Ohio State Univ., and E. M. Funk, Asst. Prof. Poultry Husbandry. Mo. State Univ. J. B. Lippincott Co. $5.00.

Practical Farming for the South — By Benjamin F. Bullock, now Prof. Rural Education, Atlanta Univ. Univ. of North Carolina Press. $2.50.

Profitable Poultry Keeping—By H. Clyde Knandel, Head, Dept. Poultry Husb., Penn State College. Orange Judd Publishing Co., Inc. $3.00.

Repairing Farm Machinery—By Ivan G. Morrison, Asst. Professor Agri. Education, Purdue Univ. The Interstate Printers & Publishers. $2.25.

Seaman A. Knapp—Schoolmaster of American Agriculture—By Joseph C. Bailey, Dept. History and Social Science, Hunter College. Columbia University Press. 1945. $3.25.

Sheep Production—By Levi Jackson Horlacher, B.S.A., M.A., Asst. to Dean, Col. Ag. Univ. Ky. McGraw-Hill Book Co., Inc. $4.50.

Soil Conservation—By Hugh Hammond Bennett, Chief, Soil Conservation Service, U. S. Dept. of Agric. McGraw-Hill Book Co., Inc. $6.50.

Successful Poultry Management—By Morley A. Jull, Professor and Head of Poultry Dept., Univ. of Maryland. McGraw-Hill Book Co., Inc. $3.50.

Success on the Small Farm—by Haydn S. Pearson, author. McGraw-Hill Book Company. $2.50.

The American Land — Its History and Its Uses — By William R. Van Dersal, biologist in the U. S. D. A. Oxford University Press. $3.75.

The Farm Primer—By Walter Magnes Teller, formerly with the Farm Security Administration, U. S. D. A. David McKay Co. $2.50.

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COMMENTS

"I have been reading the Digest [illegible] very well balanced to include [illegible] the articles are well chosen [illegible]

"The Farmers Digest is a [illegible] Vocational Department, and I [illegible] keeping up to date on farm [illegible] issue."

"I should like to add that I have [illegible] since about a year after it was started [illegible] most valuable agricultural [illegible]

"We like the 'Farmer's Digest' better every day."

"I value your magazine highly and [illegible] about farming out of it."

"My first contact with this [illegible] to my mind it fills a long felt [illegible] desires to keep up to date with the [illegible] does not have the time to read all [illegible] necessary to do this."

"I want to express my appreciation of your [illegible] assure you that I regard it as [illegible] periodicals."

"Every time your Digest comes I grab it [illegible] pronto. Of course, they aren't all [illegible] are are A1."

"I enjoy the Farmer's Digest [illegible] of general information [illegible] which I know because [illegible] to be of real value to a [illegible]

"Please accept congratulations [illegible] it is a needed one."

"Thou shalt inherit the holy earth as a faithful steward conserving its resources and productivity from generation to generation. Thou shalt safeguard thy fields from soil erosion, thy living waters from drying up, thy forests from desolation, and protect thy hills from overgrazing by the herds, that thy descendants may have abundance forever. If any shall fail in this stewardship of the land, thy fruitful fields shall become sterile ground or wasting gullies, and thy descendants shall decrease and live in poverty or perish from off the face of the earth."

WALTER CLAY LOWDERMILK
Soil Conservationist